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LECTURES

ON THE

NERVOUS SYSTEM.

LECTURES

ON

THE NERVOUS SYSTEM

47180

AND ITS

DISEASES,

BY MARSHALL HALL, M.D. F.R.S.

L. AND E.

LECTURER ON THE THEORY AND PRACTICE OF MEDICINE, ETC. ETC.

PHILADELPHIA:
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1836.

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TO

P. CH. A. LOUIS, M. D. ETC. ETC.

WOULD IT WERE MORE WORTHY OF

THAT DISTINGUISHED NAME!

MARSHALL HALL.

14 *Manchester Square, April,* 1836.

ADVERTISEMENT.

THE following Notes of Lectures delivered in the Summer of 1835,—for I wish them to be viewed but as notes,—present the outline of an investigation in which I have been for some time engaged. There are many subjects pointed out in it, requiring renewed *anatomical*, *experimental*, *clinical*, and *historical* research; and to these I propose to devote my future studies. How interesting and valuable would a series of cases be, taken in the rigid spirit of truth, and with a continual reference to the divisions of the nervous system, which I have proposed!

Like the scientific traveller I have sketched my rout, to which I shall adhere, or from which I shall deviate, according as new views may present themselves, and direct my further progress. I may truly say,—" None scribo hoc temere: quo minus familiaris sum, hoc sum ad investigandum curiosior."—CIC. Ep. ad Fam.

ARRANGEMENT

AND

TABLE OF CONTENTS.

LECTURE I.

I. THE Anatomy of the Nervous System . 19
  1. The Cerebral, or the Sentient and Voluntary.
  II. The True Spinal, or the Excito-motory.
  III. The Ganglionic, or the Nutrient, the Secretory, &c. 21
  The Physiology of the Nervous System . 28—47

LECTURE II.

III. The Pathology of the Nervous System . 48—66
IV. The Therapeutics of the Nervous System 66—69

LECTURE III.

V. The Congenital States of the Nervous System; Asphyxia, its Remedies, &c. . . 70—88

LECTURE IV.

VI. Encephalitis, Tuberculous Hydrocephalus, and Hydrocephaloid Diseases . . 89—103

LECTURE V.

VII. The Convulsive Diseases of Infants; Paralysis, &c. . . . . . . 104—125

LECTURE VI.

VIII. The Nervous System and its Diseases in Adult Age . . . . 126—132
IX. Encephalitis . . . . . 132—140

LECTURE VII.

X. Congestion and Hæmorrhagy . . 141—147
XI. Tubercles; Tumors . . . . . 147—149
XII. Hypertrophy; Atrophy . . . 150—151
XIII. Mania . . . . 151—154

LECTURE VIII.

XIV. Cerebral Diseases resulting from various affections of the System . . . 155—169
I. Intestinal Irritation.
II. Exhaustion from Loss of Blood.
III. Chlorosis.
IV. Excessive Study; Shock; Alcohol, &c.
I. Delirium Tremens.

II. Delirium Traumaticum.
V. Affections of the Kidney;
I. Dropsy.
II. Ischuria.

LECTURE IX.

XV. The Diseases of the Cerebral Nerves. 170—184
I. Paralysis,
I. Of the Sentient Nerves,
II. Of the Voluntary Nerves.
II. Augmented Action . . 236—238
I. Of the Sentient Nerves;
I. Inflammation; Ulceration; Tumors; &c.
II. Neuralgia.
III. Hemicrania; Brow Ague, &c.
II. Of the Voluntary Nerves;
Spasm?
XVI. Diseases of the Cerebellum . . 185—188

LECTURE X.

XVII. The Diseases of the Spinal Marrow. 189—190
I. The Centric Diseases, or Diseases of the True Spinal Marrow itself.
II. The Eccentric Diseases, or Diseases excited through the Excitor Nerves.

III. The Diseases of the Motor Nerves.

XVIII. Inflammation within the Spine . 190—196

I. Inflammation of the Membranes, or Spinal Meningitis.

II. Inflammation of the Substance, or Spinal Myelitis;

1. Of the Cerebral, or Sentient and Motor Tracts.

2. Of the True Medulla.

3. Of its Principal Divisions.

XIX. Congestions; Hæmorrhagy . . . 197

XX. Céntric Convulsions or Epilepsy . 197—199

XXI. Paralysis Agitans. . . . 199—200

1. General; or

2. Hemiplegic.

XXII. Tremor Mercurialis . . . 201

LECTURE XI.

XXIII. The Eccentric Diseases of the Spinal Marrow . . . . . 202—222

I. Eccentric Epilepsy.

II. Puerperal Convulsion.

III. Tetanus.

IV. Hydrophobia.

V. Hysteria; Chorea; Stammering.

VI. Spasmodic Asthma.

VII. Vomiting.

VIII. Tenesmus; Strangury.

IX. Abortion.

LECTURE XII.

XXIV. Diseases of the Spinal Motor Nerves 223—234
I. Spasmodic Strabismus.
II. Spasmodic Tic.
III. Spasmodic Torticollis.
IV. Spasms of the Respiratory Muscles.
XXV. Diseases of the Ganglionic Nerves 234—235
XXIV. The Fifth Pair . . . . . 239—240

LECTURES

ON THE

NERVOUS SYSTEM.

LECTURES

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NERVOUS SYSTEM.

LECTURE I.

GENTLEMEN,

1. I am about to bring before you an important Class of diseases,—that of the Diseases of the Nervous System.

2. I have, for some years, been prosecuting this subject; but I find it is so extensive and intricate, that, even after so considerable a period, I am only able to present you with a slight sketch of the plan and objects of my investigation, the maturer results of which will be submitted, in succession, to the profession.

3. I have endeavoured to pursue this inquiry through the medium of anatomy, physiology, and pathology; but my aim has also continually been to improve the diagnosis and practice. I think that the science and art of medicine are by no means incompatible acquirements, and that the

boast of being a mere practitioner should cease to be a cloak for ignorance and indolence. To pretend to understand the diseases of the nervous system without an intimate knowledge of its anatomy, physiology, and pathology, is the height of folly or presumption. The symptoms of these diseases can be justly interpreted by the anatomist, the physiologist, alone; and an accurate knowledge of the symptoms is absolutely necessary to practice: it is the principal source of the diagnosis, and our constant guide in the administration of remedies.

4. Nor is a knowledge of the structure and functions, the anatomy and physiology, of the nervous system, sufficient alone, for the full comprehension of the diseases of this system. The nervous system does not exercise its functions uninfluenced by the other systems of the animal economy or by the general system as a whole. The reciprocal influence of these, and the nervous system, must be clearly understood before our view of the subject can be said to be satisfactory.

5. Indeed, the entire economy of the human frame, although constituted by various systems, is one and indivisible; and it is impossible that one of those systems should be morbidly affected without the participation of the rest. In order to accommodate this difficult and complicated subject to our limited understanding, it has been found necessary, however, in the pursuit of medical science, to proceed analytically, and to imagine the different systems of which the whole animal economy is composed, to be separated so as to ad-

mit of distinct examination; and we speak of the nervous, the circulatory, the respiratory, the digestive, the urinary, the uterine systems, &c. as distinct objects of inquiry. We are compelled, however, afterwards, to review the subject synthetically, and to consider the influences of one or more of these systems, or of the general system, upon the other systems, respectively.

6. On the present occasion I proceed to treat, in this manner, of the nervous system; or of that system by means of which we are connected, through sensation, perception, judgment, volition and voluntary motion, with the external world;—that system by means of which the *ingesta* and *egesta* of the animal economy are regulated;—that system by the agency of which, out of the ingesta, the various organs, limbs, &c. are formed and nourished.

7. The first objects which will occupy us will be the anatomy and physiology of the nervous system: we shall then consider its pathology. This will naturally lead us to consider the individual diseases to which this system is liable. We shall then trace the influence of morbid states of the other systems taken individually, and of the general system, upon the nervous system. This plan will be pursued both in regard to the infant and the adult.

I.—THE ANATOMY OF THE NERVOUS SYSTEM.

8. I believe all anatomists have divided the

nervous system into the cerebro-spinal and the sympathetic. The first of these is represented in this plate by M. Mance: it consists, first, of the cerebrum and cerebellum; secondly, of sentient nerves, which pursue their course to them, and of motor nerves, which proceed from them, either along the base of the brain, or along the spinal marrow, and then along every external part of the animal frame. The second is partly represented in this other plate, by the same anatomist: it comprehends the internal ganglionic or sympathetic.

9. To these two subdivisions of the nervous system, I believe a third must be added, before our views of that system can be considered as at all complete;—it is one which I claim the merit of first pointing out in all its fulness. Suppose the cerebrum and cerebellum, the *centre* of the first subdivisions of the nervous system, and the ganglionic, or the second subdivision of this system, removed, *this remains*. It consists of the *true* spinal marrow, distinguished from the sentient and motor nerves which run along its course, as an *axis* of *excitor* and *motor* nerves. It is the seat of a peculiar series of physiological phenomena, and a peculiar class of pathological affections.

10. In the former are included *all* the functions which relate to the immediate acts of *ingestion* and *egestion*; to the latter, *all* spasmodic diseases.

11. According to this view of the subject, instead of dividing the nervous system into—

I. *The Cerebro-Spinal,* and
II. *The Ganglionic, or Sympathetic,*

I would propose to divide it into---

I. *The Cerebral,* or *the Sentient* and *Voluntary*;
II. *The True Spinal,* or *the Excito-motory*; and
III. *The Ganglionic,* or *the Nutrient, the Secretory,* &c.

12. I think, too, that there is good reason for veiwing the fifth and the posterior spinal nerves as constituting an external ganglionic system, for the nutrition, &c. of the external organs; so that I would further propose to subdivide the ganglionic subdivision of the nervous system into---

1. The *Internal,* comprising
    1. *The Sympathetic;*
    2. *The Pneumo-gastric.*

2. The *External,* comprising
    1. *The Fifth;*
    2. *The Posterior Spinal.*

13. I must, in the first place, observe, that the designation, cerebro-spinal, is incorrect. It comprises *two* subdivisions of the nervous system, which must be distinguished from each other, and of which the cerebrum and the true spinal marrow are the respective centre and axis. I shall proceed to treat of each of these.

14. The first comprises every part of the nervous system which relates to *sensation* and *voli-*

tion, the nerves of *sense*—the olfactory, the optic, the auditory, the gustatory, the nerves of touch, and the whole of the nerves of voluntary motion. Its centre is the cerebrum, including the cerebellum; its sentient nerves run variously from the organs of sense, and from the *external* surfaces, first *without* the cranium or spine, and then *within* the cranium or spine, *to* that centre; its voluntary nerves pursue a similar but retrograde course *from* that centre to the muscles of voluntary motion

15. In speaking of the cerebral subdivision of the nervous system, I shall particularly notice.

The Cerebral, or Sentient and Voluntary System.

I. THE MEMBRANES.
  1. *Of the Summit*;
  2. *Of the Base.*

II. THE CEREBRUM, and its principal divisions, viz.
  1. The *Cortical Substance*;
  2. The *Medullary Substance*;
  3. The *Hemispheres*;
  4. The *Anterior Lobes*;
  5. The *Corpora Striata*;
  6. The *Thalami*;
  7. The *Tuber Annulare.*

III. THE CEREBRAL NERVES.
  I. The *Sentient*;
    1. The *First*, or *Olfactory*;
    2. The *Second*, or *Optic*;
    3. The *Fifth*, or *Trifacial*;

The Cerebral System.

- 4. The *Eighth,** or *Auditory;*
- 5. The *Ninth,* the *Glosso-pharyngeal,* or *Gustatory (?)*†
- 6. The *Posterior Spinal;*

II. The *Voluntary;*

- 1. The *Third,* or *Oculo-motory;*
- 2. The *Minor position of the Fifth,* or *Molicatory;*
- 3. The *Twelfth,* or *Myo-glossal;*
- 4. The *Anterior Spinal,*—
  - 1. In their course *within* the Cranium;
  - 2. In their course *without* the Cranium;
  - 3. In their course *within* the Spine, usually viewed as the **SPINAL MARROW;**
  - 4. In their course *without* the Spine.

IV. THE CEREBELLUM.

- 1. The *Middle Lobe;*
- 2. The *Lateral Lobes.*

---

* In my account of the Nerves, I follow the enumeration of Arnold, as being the freest from hypothesis:

1. *The First is the Olfactory.*
2. *The Second, the Optic.*
3. *The Third, the Oculo-motory.*
4. *The Fourth, the Trochlearis Oculi, or Patheticus.*
5. *The Fifth, the Trifacial.*
6. *The Sixth, the Abducens Oculi.*
7. *The Seventh, the Facial, or Portio duro.*
8. *The Eighth, the Auditory, or Portio mollis.*
9. *The Ninth, the Glosso-pharyngeal.*
10. *The Tenth, the Pneumo-gastric.*
11. *The Eleventh, the Spinal Accessory.*
12. *The Twelfth, the Myo- or Hypo-glossal.*

† Professor Panizza; see the Edinb. Med. and Surg. Journ. vol. xlv. p. 70.

16. A peculiar set of nerves constitute, with the true spinal marrow as their *axis*, the second subdivision of the nervous system. As those of the former subdivision were distinguished into sentient and voluntary, these may be distinguished into the *excitor* and *motory*. The first, or the excitor nerves, pursue their course principally from *internal* surfaces, characterized by peculiar excitabilities, *to* the true medulla oblongata and spinalis; the second, or the motor nerves, pursue a reflex course *from* that medulla to muscles having peculiar actions concerned principally in ingestion and egestion. The motions connected with the former, or cerebral subdivision, are sometimes, nay, frequently, *spontaneous;* those connected with the true spinal are, I believe, *always excited.*

17. The anatomy of this subdivision is still little known. I propose the subject to myself for investigation. I will merely venture, on the present occasion, to present you with a brief outline of it, by way of example:

The True Spinal, or Excito-motory System.

I. The Membranes.

II. The True Medulla; its principal divisions, viz.

  1. The *Tubercula Quadrigemina;*[*]
  2. The *Medulla Oblongata;*
  3. The *Medulla Spinalis,* and especially its—
     1. *Cervical,*
     2. *Dorsal,*

---

[*] See Recherches sur le Système Nerveux; par M. Flourens, p. xxi—xxii.

The True Spinal, or Excito-motory System.

3. *Lumbar*, and
4. *Sacral Portions*.

III. THE TRUE SPINAL NERVES.

I. The *Excitors*, These belong chiefly, perhaps entirely, to—

1. The *Fifth*, or *Trifacial*;
2. The *Pneumo-gastric*, and
3. The *Posterior Spinal Nerves*.

1. The Excitor branches of the first of these are distributed to—

1. The *Eye-lid*,
2. The *Nostril*,
3. The *Fauces*,*
4. The *Face*.

2. The Excitor branches of the second, to—

1. The *Larynx*,†
2. The *Pharynx*,
3. The *Lungs*,
4. The *Stomach*.

3. The Excitor branches of the third, to—

1. The *Anus*,
2. The *Cervix Vesicæ*,
3. The *Cervix Uteri*,
4. The *General Sruface of the body*.

II. The *Reflex*, or *Motor*, *Branches* are distributed to—

1. The *Orbicularis*, viz.
The Seventh.

---

* The naso-palatine; the pharyngeus; see Bellingeri; Arnold, &c.

† The *internal* laryngeal; see Scarpa, Tab. III.

The True Spinal, or Excito-motory System.

2. The *Eye-ball*, viz.
    1. The Fourth,
    2. The Sixth.
3. The *Larynx*, viz.
    The Tenth, or Pneumo-gastric, viz. the Superior and Inferior Laryngeals.
4. The *Pharynx*, viz.
    The Tenth, or Pneumo-gastric.
5. The *Muscles of Respiration*, and principally,
    1. The Spinal Accessory, or Superior Respiratory.
    2. The Phrenic, or Internal Respiratory.
    3. The Inferior External Respiratory.—Sir Charles Bell.
6. The *Sphincters*,
7. The *Ejaculators*, and
8. The *Uterus*.
    Spinal Nerves.
9. The *General Muscular System*.
    Spinal Nerves; Nerves of Tone.

18. These arrangements will be perfectly intelligible to you when I come to speak of the physiology; but, before I proceed to that part of my lecture, I must draw your attention once more to the third subdivision of the nervous system, or the ganglionic.

19. The *internal* ganglionic includes that usually denominated the sympathetic, and probably filaments of the pneumogastric. The external ganglionic embraces the fifth, and the posterior spinal nerves.

20. The ganglia upon the nerves were first observed to be attached to the portio major of the fifth and the posterior spinal nerves, not, as Sir Charles Bell states*, by Monro, but by Prochaska This latter author observes, in the preface to a republication of his work in 1800:—

21. "Hic tractatus, qui anno 1779 prodivit, plures novas observationes circa structuram systematis nervosi a me factas continet. Harum nonnullæ, quibus intextu non fuit locus, in explicatione figurarum uberius exponuntur, ad quas spactat nova arbor vitæ corporum olivarium, vid. Tab. I. fig. 3, 4, 5; fasciculus funiculorum nerveorum quinti paris cerebri, qui insalutato ganglio semilunari sub eodem tertium ramum ejus nervi maxillarem inferiorem dictum petit, vid. Tab. II. fig. 4, 5; sic quoque radices anteriores omnium nervorum spinalium, quæ insalutata ganglia radicum posteriorum transeunt, vid. Tab. III. fig. 1, 2. Super eandum materiem plura præclara scripta isto tractatu serius in lucem prodivere, inter quæ præcipue *Monroi Observations on the Structure and Functions of the Nervous System* (1783); *Soemeringi Ulber das Organ der Seele, Königsberg*, 1796; *et Reilii Exercitationes Anatomicæ de Structura Nervorum*, 1797, adnotari merentur."

22. The arguments for these divisions are principally physiological; they will be given, therefore, more connectedly, in that division of my subject to which I now proceed.

---

*The Nervous System, 1830, Pref. p. viii, &c.

II.—THE PHYSIOLOGY OF THE NERVOUS SYSTEM.

23. In order to convey a distinct idea of my views of the nervous system at once, I shall begin by the detail of one experiment and the performance of another.

24. A horse was struck with the poll-axe over the anterior lobes of the brain. It fell instantly, as if struck with a thunder-bolt; it was convulsed, and then remained motionless. It shortly began to breathe, and continued to breathe freely by the diaphragm.

25. When lacerated or pricked by a sharp or pointed instrument, as a *pin* or a *nail*, on any part of the face or surface of the body, it was totally motionless, manifesting no evidence of sensation or volition.

26. When, on the other hand, the *eye-lash* was touched with a *straw*, the eye-lid was forcibly closed by the action of the *orbicularis*. When the cornea was touched, the eye-ball revolved outward by the action of the *abducens*. When the verge of the anus was touched, the *sphincter* contracted forcibly, the tail was raised, the vulva was drawn towards the anus.

27. The upper part of the medulla oblongata was now destroyed by an instrument passed through the orifice made by the poll-axe: there were violent convulsions; the respiration ceased, and the eye-lid and eye-ball remained motionless on the application of stimuli.

28. Now, I imagine that it will not be disputed, that the blow of the poll-axe, in this case annihilated the cerebral or sentient and voluntary functions; and that a peculiar set of excito-motory phenomena remained. Deep lacerations produced no evidence of the former; the touch of a straw induced a full manifestation of the latter. The destruction of the medulla oblongata removed all trace of excito-motory phenomena in the eye-lid and eye-ball.

29. You observe this living frog: its sentient and voluntary functions are obvious. I divide the spinal marrow, below the occiput, with these scissors: all is still. There is not a trace of *spontaneous* motion. The animal would remain in this very form and position, without change, until *all* signs of vitality were extinct. But now I pinch a toe with the forceps. You see how both posterior extremities are moved. All is now still again; there is no spontaneous motion, no *sign of pain* from the wound made in the neck. It is without sensibility—without volition; the *power* to move remains—the *will* is extinct. I now pinch the integument. You observe the result—the immediate recurrence of excit-omotory phenomena.

30. I now destroy the whole spinal marrow with this probe. It is in vain that I pinch the toes; the animal, the limbs are motionless!

31. Could the former *excited* motions be those of irritability? I will try the truth of this suggestion by seeing whether, now that the axis of the excito-motory system is destroyed, with its phe-

nomena, the application of a slight galvanic shock will prove the subsistence of irritability. You see how instantaneously and forcibly the muscles are stimulated to contraction.

32. Is not the proof, from these experiments, of the distinction between the motions of volition of the excito-motory system, and of these from those of irritability, perfectly and unequivocally complete?

33. I must now proceed more systematically with my lecture.

34. I shall not detain you long with the physiology of the cerebral subdivision of the nervous system; it embraces sensation, perception, judgment, volition, and voluntary motion.

35. The senses are the smell, the sight, the hearing, the taste, and the touch; they convey to the mind all we know of the external world. Perception is derived from them. Volition is a subsequent mental act, and voluntary motion a frequent result. And thus the motions which result from sensation always *imply volition;* but as volition may exist without any previous sensation, the voluntary motions are frequently *spontaneous.* It is by this character that the motions which belong to the sentient and voluntary system are distinguished from those which belong to the excito-motory: these are never spontaneous; they are *always excited.* Even the motions of respiration, as far as they belong to this system, are excited motions, as I shall show immediately. Legallois,

M. Flourens, Sir Charles Bell, are equally in error, I think, when they consider the medulla oblongata as the *source*, the *primum mobile*, of the respiratory motions; it is the *channel* through which the excitors act, and the organ which *combines* the different movements which constitute the acts of respiration; but the true *source* of these movements are certain excitor nerves,—the excitors of respiration,---and principally branches of the pneumo-gastric, but also of the fifth and spinal nerves. Equally remote from the truth, I think, is the opinion of Dr. Philip and Mr. Mayo, that the acts of the respiration are entirely voluntary. This is, in fact, a mixed function, as *all* the acts of the excito-motory system may be; and although generally belonging to the excito-motory system, yet capable of being affected through the medium of volition. This subject will be pursued hereafter.

36. A point which belongs more immediately to our present subject,---the cerebral system,---is that of the influence of the senses over the acts of volition. There is a case of anæsthesia, published by Dr. Yelloly, in the transactions of the Medico-Chirurgical Society, vol. iii. p. 99. The patient could hold a cup in her hand securely, if she kept her eyes fixed upon it; but if she ceased to look at it, it fell to the ground. I have this day seen a patient with a slight degree of paralysis of feeling and of voluntary motion in his lower limbs. He walks safely whilst his eyes are fixed upon the

ground, but stumbles immediately if he attempts to walk in the dark. His own words are, "my feet are numb; I cannot tell in the dark where they are, and I cannot poise myself." The voluntary motions are regulated by the sense of touch, when this is unimpaired, or by that of sight, when the touch is paralyzed.

37. Many attempts have been made to *localize* the functions of the cerebrum; that is, to prove certain functions to be attached to certain parts of that organ; without, however, much success. The facts supplied by pathology certainly lead us to the conclusion that the hemispheres of the cerebrum and cerebellum regulate the *voluntary* movements of the *opposite* side of the body; whilst the medulla oblongata and spinalis *convey* these acts of *volition* to the *corresponding* side. It has been asserted, from similar facts, that the anterior lobes of the brain govern the speech; the corpora striata, the inferior extremities; and the thalami, the superior extremities; but I fear these deductions are not sufficiently substantiated. The same remark must be made relative to the supposed connection between the cortical portion of the cerebrum and the intellectual faculties, and the cineritious portion, and the movements. I shall revert to these opinions immediately.

38. I now proceed to treat of the acts of the excito-motory system. As the designation of this system implies, there is always the application of an appropriate stimulus, or cause of excitement or

irritation; this is followed by the contraction of peculiar sets of muscles. It is clearly proved that the influence of the stimulus is carried along an excitor and incident nerve, to the medulla oblongata or medulla spinalis, and that it is reflected thence along other reflex or motor nerves. The incident excitor nerves, the medulla, and the reflex motor nerves, constitute the system. They remain as I have already stated, after the centre of the cerebral system has been removed by experiment, or destroyed by disease. Their distribution takes place principally about the larynx and pharynx, in connection with the medulla oblongata; and about the sphincters, in connection with the lower part of the spinal marrow; and hence they especially guard the *orifices* and *exits* of the animal frame. Other parts of the system govern the acts of *ingestion*,—deglutition, and respiration;—and the acts of *excretion*,—of the fæces, urine, and semen. A third portion of the system gives general tone to the muscular egestion, and consequently to the limbs.

39. I shall now explain the manner in which these several acts and functions are performed.

40. I have detailed the experiment of a horse felled and reduced to a state of insensibility by the poll-axe. No infliction upon the skin, by a pin or other pointed instrument, was felt---no voluntary motion induced; but the touch of a straw, applied to an eye-lash, or to the cornea, immediately induced forcible contractions of the orbicularis palpe-

bræ, and the abducens oculi. There can be no doubt that a filament of the first branch of the fifth pair of nerves, or trifacial, conveyed the impression to the medulla oblongata; and that a filament of the seventh pair, or facial, reconveyed it from the medulla oblongata to the orbicularis, or the abducens nerve, to the abducens muscle of the eye. All this is wonderful, and, I believe, hitherto quite unknown to physiologists. But the light touch of the same portion of straw applied to the verge of the anus, induced a firm contraction of its sphincter. In this case the physiology is similar; but the anatomy is unexplored. Nerves which arise from the verge of the anus take their course to the spinal marrow; whence some mysterious influence is returned to the sphincter muscle!

41. These facts and this rationale may be taken *instar omnium.* Similar phenomena are presented to our observation in our daily visits to the sick. The symptoms of apoplexy and of hydrocephalus are only to be understood by a reference to the distinct functions of the distinct subdivisions of the nervous system. In the former there is perfect coma---blindness, deafness, perhaps insensibility to impressions which would, in other circumstances, be productive of pain; yet the patient breathes, and the sphincters still do their office. In hydrocephalus, or the hydrocephaloid disease, there may be a dilated pupil, with total blindness; yet, although the eye remains unclosed whilst the

finger or any other object approaches the cornea, a touch of the tip of an eye-lash immediately induces the closure of the eye-lids! At length, with augmented disease, this phenomenon ceases in its turn. The excitor nerve of the eye-lash loses its excitability, or the motor of the orbicularis its motor power: the eye-lids are unmoved on touching the eye-lash, and are permanently but half closed. The respiratory muscles and the sphincters fail in their several offices. These are interesting facts; for they not only denote the seat and the nature, but the degree of the disease.

42. Filaments of the fifth pair of nerves are the excitors distributed upon the border of the eye-lid and surface of the eye-ball,---upon the nostrils,---probably upon the fauces,---certainly upon the face,---and are the *first* agents inducing closure of the eye-lid, sneezing, vomiting, and sobbing, when the eye-lash is touched, the nostrils stimulated, the fauces irritated, or cold water is dashed upon the face. Other, motor, nerves convey the reflex influence from the medulla oblongata to the orbicularis, and the various respiratory muscles whose actions are combined to the acts of sneezing, vomiting, and sobbing.

43. Filaments of the pneumo-gastric are the excitors, when carbonic acid gas, or a drop of water comes into contact with the larynx---when the dust of ipecacuanha is inhaled into the bronchia with the effect of inducing asthma---in deglutition,

—in ordinary respiration,—and in the act of vomiting produced by antimony in the stomach and calculi in the gall-duct or ureter.

44. There are several interesting and peculiar facts connected with excito-motor system which I must now briefly mention. If the fifth nerve in the fauces be irritated, vomiting is induced, if, on the contrary, the eighth in the pharynx be excited, the act of swallowing follows. It has happened, that when a patient has wished to excite vomiting by tickling the *fauces* with a feather, he has, by passing it into the *pharynx*, induced such an action of the muscles of deglutition, as has drawn it into the œsophagus. There are two interesting cases of this kind in the Medical Observations and Inquiries, vol. iii, p. 7, and vol. vi, p. 231. A similar event has occurred with regard to the female catheter; certain nerves being excited on introducing this instrument, an action of the muscles has been induced, which has drawn the catheter out of the fingers of the surgeon into the bladder. I show you a catheter which was extracted from the bladder after such an accident. The very case is detailed in the Medical Facts and Observations, vol. i, p. 96; and I am indebted for the catheter itself to the kindness of Mr. Copeland. Such cases are not rare even. My friend, Mr. Toogood, of Bridgewater, has been called to two such accidents, and extracted the catheter by the urethra. The *cause* of the occurrence has not been pointed out before. I believe

a similar event has taken place in regard to the rectum.

45. I have already observed that the excito-motory division of the nervous system presides over the acts of ingestion and excretion;---over the ingestion of air, of food;---and over the expulsion of the fæces, the urine, the semen, and the fœtus. In reference to respiration, several facts render it probable, although distinct experiments are required to render it certain, that the act of ordinary inspiration is *excited* by the contact of a certain proportion of carbonic acid with the filaments of the pneumo-gastric nerve in the lungs: Dr. Faraday particularly mentions the fact, that the respiration can be suspended longer after repeated deep inspirations, by which the air of the lungs is completely renewed, than in ordinary circumstances;* in Hook's celebrated experiment,† a stream of atmospheric air was driven through the trachea, the lungs, and incisions made through the pleura in a living dog; the animal made no effort to inspire whilst this stream was continuous, but, when it was interrupted, the efforts of inspiration were violent and convulsive. In this manner we may understand the *impossibility* of suspending the respiration beyond a certain period. In this manner we understand why an animal dies convulsed from submersion under water if the pneumo-

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* The Lond. and Edinb. Phil. Mag. vol. iii, 1833.

† See the Phil. Trans. for 1667, p. 539.

gastric nerves be entire, but without convulsions if they be divided*.

46. Legallois, M. Flourens, and Sir Charles Bell, have erroneously considered the acts of the respiration as *spontaneous*, and the medulla oblongata as their source and *primum mobile*. I think I have, on the contrary, proved by experiments that this important function consists of excited acts, *excited* through a peculiar system of *excitor* nerves, and principally filaments of the fifth, the pneumo-gastric, and the spinal nerves. You dash cold water on the face of your patient, you pinch the pneumo-gastric in an experiment, or you sink gradually into the sea in bathing; in each case an act of inspiration is excited. Compare these nerves at their origin, and you will

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* M. Brachet refers the acts of respiration to the agency of the cerebrum, to which the feeling of want of respiration, "besoin de respirer,". is conveyed by the pneumo-gastric nerve. He forgets that respiration proceeds after the cerebrum is destroyed; and he is exceedingly puzzled by the fact, that this function equally continues after the division of the pneumogastic; he observes, "dans ce cas, il ne faut point attribuer la continuation de la respiration au besoin senti de respirer, *mais à l'habitude que le système nerveux cerebro-spinal a contractée de faire mouvoir les muscles respirateurs!*" p. 132. The truth is, that respiration, as stated of old, like all the functions of the excito-motory class, is a "mixed" function: it is cerebral when both the pneumo-gastric nerves have been divided; it is purely excito-motory when the cerebrum has been removed: it is annihilated when *both* these influences have been subtractcd, either by performing these two operations *in succession*, or *at once*, as in dividing the medulla oblongata, at the origin of the pneumo-gastric nerves.

find that they all agree in one remarkable character—that of being formed of numerous distinct filaments. Compare their functions, and you will find them extremely complicated. They are all, however, excitors, of respiration. The medulla oblongata,* and not the pneumo-gastric nerve,† *combines* the action of the different muscles together into acts of respiration, &c. whilst this nerve is one of the *excitors* of these combined actions.

47. I perfectly agree with Sir Charles Bell in the opinion that the respiratory is entirely distinct from the other subdivisions of the nervous system; but I venture to differ from him in viewing the respiratory as but *a part* of a more extensive system—as an *excited* and not a *spontaneous* function—as *originating*, when the cerebrum is removed, in the pneumo-gastric *as its excitor*, and not in the medulla oblongata.

48. The act of deglutition is also an excited act: it requires the presence of some stimulus,—of some substance to be swallowed: it is impossible to perform the act of swallowing three or four times in rapid succession, without taking something into the mouth: the absence of an excitant annuls the act, which, if it take place at all, must be an excited act. Yet this very act was excited in the most distinct manner, in an experiment of

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* Recherches sur le Système Nerveux, par M. Flourens, p. 180, &c.

† The Nervous System, by Sir Charles Bell, 1830, p. 46.

M. Magendie, by passing the finger into the *pharynx* of a dog, through an incision made between the thyroid cartilage and the os hyoides. A filament of the pneumo-gastric is stimulated; the effect of stimulus is conveyed to the medulla oblongata, reflected thence, and conveyed by appropriate motor nerves to the muscles of deglutition. Similar nerves are excitors and motors, under analogous circumstances, in regulating the action of the ejaculatores seminis.

49. The effect of cold water, suddenly applied to the surface of the body, is very remarkable and highly illustrative of other of the excito-motory functions besides respiration: if you dash cold water on the lower extremities of a patient, the sphincters are sometimes relaxed, with the expulsion of the urine, or of the fæces. It is probable that, at birth, the respiration is first excited, and the sphincters are first relaxed, by the contact of the cold atmosphere with the filaments of the fifth and spinal nerves.

50. I must now mention another fact. The whole *tone* of the muscular system is the result of an excito-motory function. The limbs of an animal, or of a part of an animal separated from the influence of the cerebrum, become relaxed on destroying the spinal marrow. If we remove the tail and the rectum from a recently decapitated turtle, the sphincter retains its circular form, the tail its firmness,—phenomena which cease entirely on withdrawing the portion of spinal marrow re-

maining within the caudal spinal canal.—I will notice in this place some other interesting experiments on this animal of cold blood, detailed in a paper published in the Transactions of the Royal Society, for 1833.

51. A turtle was decapitated in the manner usual with cooks, by means of a knife, which divided the second or third vertebra.

52. The head being placed upon the table for observation, it was first remarked that the mouth opened and shut, and that the submaxillary integuments descended and ascended, alternately, from time to time, replacing the acts of respiration. I touched the eye or eye-lid with a probe. It was immediately closed: the other eye closed simultaneously. I then touched the nostril with a probe. The mouth was immediately opened widely, and the submaxillary membranes descended. This effect was especially induced on touching the nasal fringes situated just within the anterior part of the maxilla. I passed the probe up the trachea and touched the larynx. This was immediately followed by a forcible convulsive contraction of the muscles annexed to it. Having made and repeated these observations, I gently withdrew the medulla and brain. All the phenomena ceased from that moment. The eye, the nostrils, the larynx, were stimulated, but no movement followed.

53. The next observations were made upon the other parts of the animal. The limbs, the tail, were stimulated by a pointed instrument or a light-

ed taper. They were immediately moved with rapidity. The sphincter was perfectly circular and closed; it was contracted still more forcibly on the application of a stimulus. The limbs and the tail possessed a certain degree of firmness or tone, recoiled on being drawn from their position, and moved with energy on the application of the stimulus. On withdrawing the spinal marrow gently out of its canal, all these phenomena ceased. The limbs were no longer obedient to stimuli, and became perfectly flaccid, having lost all their resilience. The sphincter lost its circular form and its contracted state, becoming lax, flaccid, and shapeless. The tail was flaccid, and unmoved on the application of stimuli.

54. This experiment affords evidence of many important facts in physiology. It proves that the presence of the medulla oblongata and spinalis is necessary to the contractile function of the eyelids, the sub-maxillary textures, the larynx, the sphincters, the limbs, the tail, on the application of stimuli to the cutaneous surfaces or mucous membranes. It proves the excited reflex character of this property of the medulla oblongata and spinalis. It proves that the tone of the limbs, and the contractile property of the sphincter, depend upon the same function of the medulla spinalis,—effects not hitherto suspected by physiloogists.

55. I must now state that the phenomena which have been detailed subsist in distinct portions of the medulla. If, after severing the head of the turtle, the lower extremities and the tail be sepa-

rated together, in the manner usual with cooks, the phenomena which I have described are still observed in the distinct and separate portions of the animal. The head, the anterior extremities, and the tail present the movements which have been described, when severally stimulated. The posterior extremities alone were observed to be flaccid and unimpressible by stimuli; and these were found, on examination, to have been separated from their connection with the spinal marrow.

56. An interesting experiment demonstrates the powerful influence of the spinal marrow over the sphincter ani in the turtle. If, after the removal of the tail and the posterior extremities, with the rectum, and of course with a portion of the spinal marrow, water be forced into the intestine, by means of Read's syringe, both the cloaca and the bladder are fully distended before any part of the fluid escapes through the sphincter, which it then does on the use of much force only, and by jerks. The event is very different on withdrawing the spinal marrow: the sphincter being now relaxed, the water flows through it at once in an easy continuous stream, with the application of little force, and without inducing any distension, even of the cloaca.

57. Since the publication of this memoir, I have found that similar movements of the limbs are excited by pinching the lateral nerves, as they leave the spine, continuously, by the forceps. The influence of this stimulus is not only *reflected* upon

the limbs, but it is *retrograde* in its course, passing from a nerve proceeding from the middle part of the spine, *forwards* to the anterior, as well as backwards to the posterior extremities. This experiment appears to me to present us with the simplest *type* of some spasmodic diseases, and especially of the traumatic tetanus.

58. From other experiments on the frog, I have ascertained that the extreme filaments of the excitor nerves are more impressible by stimuli than the same nerves in their course.

59. These phenomena are most obvious in the lower orders of animals; in the very young of the higher orders; and in the state of hibernation in those animals which are susceptible of this extraordinary condition of animal life. They abundantly confirm the account which I have given of the distinction between the sentient and voluntary, and of excito-motory functions, in the human subject.

60. The third subdivision of the nervous system embraces *all* the ganglionic nerves. I have divided it into the *internal*, which comprises the sympathetic and perhaps a part of the pneumogastric; and the *external*, which embraces all the other ganglionic nerves, the *fifth* especially, and the posterior spinal.

61. The only novelty which attaches itself to this part of my division of the nervous system, is that which relates to the external ganglionic, or external nutrient, nerves.

62. I am not aware that any preceding inquirer has suggested the real office of the ganglia on the fifth and posterior spinal nerves.

63. Prochaska asks, p. 353, "Quis rationem dabit:"—"Quare radices anteriores nervorum spinalium ganglia spinalia insalutata transeant, et quare nam solæ posteriores radices ganglia spinalia trannare cogantur."—"Quare omnium cerebri nervorum solum quintum par post ortum suum more nervorum spinalium ganglion semilunare dicstum facere debet, sub quo peculiaris funiculorum fasciculus ad tertium quinti paris ramum maxillarem inferiorem dictum, properat insalutato ganglio semilunari ad similitudinem radicum anteriorum nervorum spinalium?"

64. Sœmmering has asked similar questions. Sir Charles Bell has quoted Prochaska, and Sœmmering, and Scarpa, in a tone of exultation; but I confess that to me it appears that that justly celebrated physiologist has not approached any nearer to the solution of these questions than his predecessors. Sir Charles Bell has, I believe, distinctly proved the difference of function between the anterior and posterior spinal nerves, and between the respiratory and other nerves—brilliant discoveries—which will, as long as anatomical and philosophical science last, perpetuate the memory of his genius; but there is no connection between the function of sensation and the existence of a ganglion; and the unequivocal sentient nerves, as the olfactory, the optic, the audi-

tory, are without any thing very distinct of this kind.

65. The questions, then, still remain, why is the portio major of the fifth, especially, and the posterior spinal nerves provided with ganglia? The reply to these questions, and the argument, may be stated thus:—

66. 1. There is an internal nerve for formation, nutrition, &c. 2. This nerve is ganglionic. 3. There are external organs and structures requiring nutrition, &c. There are also external ganglionic nerves. 4. The inference is plain, that these constitute the external ganglionic sub-system. The fifth especially abounds with ganglia.

67. It is true that the semilunar and external spinal ganglia differ in appearance from the ganglia of the sympathetic, as Sir Charles Bell has well displayed. What is the nature of this difference? To this question I find no reply in authors. It is plain, however, that the difference consists in their being, alone, *plexic.* The internal ganglionic nerve is purely nutrient: its ganglia are simple. The external involve sentient, and I believe excitory, nerves, with the nutrient; they combine, therefore, the appearance of the plexus and of the ganglion.

68. I must add another argument upon this point. If the sensation of the face be lost by paralysis, arising from disease of the *brain,* the eye is safe; but if the same event occur from

compression or destruction of the *fifth*, *within* the cranium, by disease, or in an experiment, the eye ceases to be nourished, and becomes destroyed! In the former case the nerve of sensation merely has suffered; in the latter the nerve of nutrition, as well as sensation, has been involved in the disease or injury.

LECTURE II.

III.—THE PATHOLOGY OF THE NERVOUS SYSTEM.

69. I now proceed to that part of the subject which it is more peculiarly my province to treat in this place—the Pathology of the nervous system.

70. In order to conceive a clear idea of the pathology, we have only to imagine the physiological phenomena, already noticed, assuming a pathological character. Now, the force of these phenomena may be augmented, diminished, or annihilated.

71. In regard to the cerebral functions, we have, in the sentient nerves, pain or insensibility; in the cerebrum itself erroneous perceptions, judgments, and volitions, or delirium; or a total deficiency of these faculties, or coma; in the motor nerves continual voluntary actions; or paralysis.

72. We may take the face with its sentient and motor nerves to illustrate a part of this subject. We may have morbid sensibility in the face; and this may assume the form of *tic douloureux*. We may, on the other hand, have less of sensibility: this may arise from disease of the opposite hemisphere, or of the fifth nerve, within or without the cranium. The former case constitutes hemiplegia of the face; the latter cases have been particularly described by Sig. Bellingeri* and Sir Charles Bell.† We have in these affections interesting calls upon your resources for the diagnosis.

73. In hemiplegia the loss of sensation is rarely complete, and there is usually paralysis of the muscle of the face, and the susceptibility of the nostrils to irritants is unimpaired; this was the case in a patient whom I recently examined, by the kindness of Dr. Watson, in the Middlesex Hospital. In the case of disease of the fifth within the cranium, the loss of sensibility is frequently complete, the nostril has also lost its susceptibility to the impression of stimuli, and eventually the eye, not being nourished, shrinks and collapses; the power of the masticatory muscles is impaired, but the face is not distorted by any *apparent* paralysis.

74. In the paralysis of the face, from the disease of the opposite hemisphere, the eye-lid can

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* Dissertatio Inauguralis, 1818.

† The Nervous System.

be closed, as in this representation;*—in paralysis of the facial nerve, the orbicularis is paralysed, as you may observe in this.† What is the rationale of this difference? The seventh, like the fifth, is a compound nerve. As the latter embraces excitor and ganglionic filaments, which are not involved in the attack of hemiplegia, so the former comprises a branch belonging to the excito-motory system, which is not affected in disease of the cerebrum. These I have not thought it necessary to designate particularly.

75. Both the fifth and the seventh pairs of nerves are, then, more complex than they are represented to be by Sir Charles Bell. The former includes excitor and nutrient nerves, with the nerve of sensation; and it has appropriate origins, distributions, and offices: of its offices, sensation alone is impaired by cerebral disease; but all are annihilated by the pressure of a tumor within the cranium. The seventh comprises pure cerebral and true spinal nerves: the cerebral only is affected in hemiplegia, and the orbicularis retains its power; all are paralysed by the pressure of a tumor below the ear, and we have paralysis of the sphincter of the eye-lid. This remark leads me to observe that *ptosis* is a cerebral paralysis, whilst *lagophthalmia* is one of the true spinal system: to the latter system ***strabismus*** also frequently belongs.

76. It was well known to the ancients, that

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* † Reference was here made to drawings.

disease in one hemisphere of the brain induces paralysis in the opposite side of the body.

77. This fact has been confirmed by modern pathologists. It has been fully ascertained that disease confined to one hemisphere of the cerebrum, or of the cerebellum, and to one side of the mesial plane in the tuber annulare, constantly affects the *opposite* side,—whilst disease, confined to one of the lateral columns of the medulla oblongata and medulla spinalis, affects the *corresponding* side, of the muscular system. The encephalon has a *crossed effect*; the medulla a *direct effect*.

78. It has been further ascertained that, *in experiments*, lesions of the encephalon induce *paralysis only*, whilst lesions of the medulla oblongata and spinalis induce *convulsion* or *paralysis*, according to its severity. Hence it becomes an important question to determine the cause of convulsive affections in *disease* of the encephalon: to this question I shall particularly direct your attention immediately.

79. Such are the *facts* in reference to this subject. I must now briefly state to you that, formerly, Saucerotte,* in his Prize Memoir present-

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* M. Flourens, du Systême Nerveux, p. 223. Bouillaud de l'Encéphalite, p. 275. Saucerotte's words are—"outre le croisement des fibres médullaires d'un côté de la tête à l'autre, il y en a encore de la partie antérieure à la partie postérieure et *vice versâ*, pour le mouvement des membres, de façon, que l'origine des nerfs destinés aux mouvements des extrémités antérieures est dans le partie postérieure du cerveau, et réci-

ed to the Académie Royal de Chirurgie, in 1768; and, more recently, MM. Foville and Pinel-Grandchamp, M. Serres, M. Lacrampe-Loustau, and M. Bouillaud, have attempted to show, that, besides this crossed effect of the cerebrum, affections of the corpus stratum, or its *middle lobe*, induce paralysis of the *inferior* extremities; whilst similar affections of the thalamus, or its *posterior lobe*, induce paralysis of the *superior* extremities; so that, if this opinion were true, there would be a *double crossed effect*. I use this phrase as a sort of *mnemonic* for you, if you should wish to speak of these opinions, for I fear I must call them by that name: M. Lallemand* and M. Andral,† after an examination of an extensive series of facts, have declared that the statement is without foundation. M. Bouillaud‡ has further attempted to show, that the disease, or lesion, of the *anterior lobe* of the cerebrum leads to a loss of the power of articulation. But this opinion is equally contested by the two authors whom I have just quoted.

80. I must now briefly notice an attempt to *localize* the affections of the brain of a different kind, but equally disputed by these pathologists:

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proquement, dans l'antérieure pour les membres inférieurs." He then applies this view to the diagnosis of partial paralysis, of one or other extremity, from hæmorrhage.

* Recherches sur l'Encephale, t. iii, p. 317, &c.

† Clinique Médicale, t. v, p. 357, &c.

‡ Traité de l'Encéphalite, p. 160, 276, &c.

MM. Delaye and Foville have stated that the grey or cortical substance is principally affected in *mania;*[*] MM. Bluchet and Cazauvieilh,[†] whilst they agree with MM. Delaye and Foville in their view of the pathology of mania, contend that in *epilepsy* it is, on the contrary, the white or *medullary* portion of the brain which is diseased.

81. The tubercula quadrigemina alone have a crossed effect, both of convulsion, and paralysis.[‡]

82. M. Ollivier[§] observes that a hæmorrhagy into the tubor annulare only paralyses the movements; M. Cruveilhier, on the contrary,[||] asserts that such an affection destroys the sensations and the movements, but leaves the intellect uninjured. How many questions, then, still remain for future inquiry to solve?

83. I need scarcely add, in this place, that in those cases in which hæmorrhagy occupies an extensive space, affecting both hemispheres of the cerebrum,—as in meningeal hæmorrhagy at the summit, or at the base of the brain, in extensive hæmorrhagy within the brain, extending from one hemisphere to the other, or into both

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[*] See Rostan, Recherches sur le Ramollissement du Cerveau, p. 247; and Cours de Médicine Clinique, ed. 2, t. iii, p. 712.

[†] De l'Epilepsie, &c. p. 45.

[‡] Recherches, &c. par M. Flourens, p. 119.

[§] Traité de la Moëlle Epinière, ed. 2, t. ii, p. 537.

[||] Anatomie Pathologique, Fasc. xxi.

ventricles,—*general* paralysis is observed; the same event takes place in the cases in which a clotis formed in the mesialline in the tuber annulare—the nodus encephali, as it has been termed.

84. Apoplexy and general paralysis are always serious. They are still more so when they affect the excito-motory system, inducing dysphagia, stertor, relaxed sphincters, &c.

85. Legallois, impressed with the idea that the spinal marrow was indued with the faculties of sensation and volition, experienced great difficulty in explaining the occurrence of paralysis from disease of the cerebrum. He observes, "Quand bien même on n'apercevrait aucum moyen de les concilier, il n'en demeurerait pas moins vrai, d'une part, qu'une affection bornée uniquement au cerveau peut oter le sentiment et le mouvement volontaire â la moitié du corps, et de l'autre, que le sentiment et le mouvement volontaire peuvent subsister et être entretenus dans un animal décapité. Quelque opposés que ces faits paraissent être, il faut se souvenir que deux faits bien constatés ne peuvent jamais s' exclure l'un l'autre, et que la contradiction qu'on croit y remarquer tient á ce qu'il y a entre eux quelque intermédiare, quelque point de contact qui nous échappe."* The facts and principles which have been detailed in this lecture enable us readily to remove this difficulty, and to account for the paralysis induced by disease of the cerebrum, on

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*Op. cit. p. 21.

one hand, and for the movements of an anencephalous fœtus in utero, or of a decapitated animal, on the other. The paralysis consists in the loss of voluntary motion; the movements of the anencephalous fœtus result from the agency of the excito-motory systsm. Legallois' error was that of mistaking the phenomena of the excito-motory system for sensation and voluntary motion; and his difficulty naturally arose out of this error. There is no real discrepancy between the two orders of facts to which Legallois refers.

86. But I must hasten on. I will close my remarks on this subject by stating, that however distinct the cerebral and true spinal subdivisions may be, they exert an influence upon each other which is essential to the well-being of the individual. The anencephalous fœtus, though it may be born alive, and even live for some hours, is not *viable*; it must *soon* die. Apoplexy and hydrocephalus destroy the patient by destroying the cerebral functions merely. During sleep even, although this be *chiefly* an affection of the brain, the functions of the true spinal marrow are somewhat impaired; the respiration is noisy, frequently slightly stertorous, and irregular. Yet the respiration does proceed, acts of deglutition take place, and the sphincters do their office. Still a marked distinction between the cerebral and the true spinal functions is, that the former are partly suspended in *sleep*, and entirely in *coma*, whilst the latter are unimpaired; in

sleep and in coma the eye-lash is susceptible to the slightest stimulus, and the orbicularis—the sphincter of the eye-lid—and the other sphincters, with the muscles of the larynx and of the respiration, do their office. This state of things cannot last long, however, in coma; because the integrity of the cerebral function is essential to the continuance of the true spinal and the other functions of the animal economy. Hence the fatal omen attached to stertor, choaking, relaxation of the sphincters, and other morbid affections of the true spinal functions, in cases of cerebral disease, already noticed, § 84.

87. On the other hand, if the excito-motory system be impaired in its functions, the acts of the cerebrum are interrupted. The volition is perfect in chorea, in stammering; but the voluntary movements, from the morbid condition of the excito-motory system, are irregular and imperfect. I have this day witnessed a remarkable fact; a patient who had suffered a degree of loss of power of the left arm and leg, from a protracted epileptic seizure, and who could not close the hand firmly otherwise, could grasp any object placed in it, with considerable force.

88. I must not, however, extend my observations on the cerebral system, but hasten to that in reference to which I particularly wish to engage your interest. That I shall readily do this, on account of the part which I myself have taken in its elucidation, I have no doubt; but I rather

wish to do so, on account of the intrinsic and practical value of the subject itself.

89. The *first* remark I would make is a very comprehensive one. I believe that the *whole* order of spasmodic and convulsive diseases belongs to this, the excito-motory division of the nervous system,—and that they cannot be understood without a previous accurate knowledge of this system!

90. Another remark is equally important. *All* these diseases have their source in *one* of three parts of the excito-motory system: the first series have their origin in the spinal marrow itself, the axis or centre of the system; I shall designate these cases by the epithet *centric*: the *second* series have their source in the excitor nerves, consequently at a distance from that centre; I shall denominate them the *eccentric*. A third series occurs, like the spasmodic tic of the seventh pair, in the course of the motor nerve. I will soon convince you that this distinction is not an unimportant one: the prognosis depends upon it almost entirely; the centric diseases are, for the most part, incurable, the eccentric diseases, on the contrary, as generally, with some particular exceptions, admit of cure. I will briefly illustrate these positions:—You have two little patients with croup-like or other convulsion; one of these cases may arise from disease within the cranium or spinal canal; it will most probably prove incurable: the other may arise from dentition, a

cause acting upon an excitor branch of the fifth; I need scarcely add that it will generally yield to the prompt and energetic use of the appropriate remedies.

91. A third remark is that in *all* or *almost all*, the order of spasmodic diseases, the parts most immediately concerned in ingestion and egestion, —the orifices and exits of the frame,—are those principally affected. The physiology has become pathology. The *larynx* is *closed* in the convulsions of children, in epilepsy, in puerperal convulsions; it is spasmodically affected in tetanus and hydrophobia; it is partially affected in the croup-like convulsions, in hysteria, in which there is frequently loss of voice, &c. The *pharynx* is affected in some of these diseases. The *respiratory* muscles are so in all. In epilepsy we observe affections of the *sphincters*, and even of the ejaculators.

92 No disease can illustrate the pathology of the excito-motory system better than epilepsy. It is sometimes centric, and incurable; frequently eccentric, arising from gastric or intestinal irritations, and curable. It involves every part, and every functions, of which I have spoken under the head of the physiology. The fourth and sixth nerves are affected, and the eyes move convulsively; the tongue is protruded, the teeth are forcibly closed upon it, the mouth is variously moved, with the extrusion of bloody foam; the larynx is closed, and there are forcible convulsive

efforts of the expiratory muscles; and, as I just stated, the sphincters are sometimes relaxed, and the ejaculators occasionally expel the semen.

93. I must say a few words, in this place, respecting the important function of generation in both sexes.

94. It is plain, from the circumstances, that the act of the συνουσια in the male sex is, irrespective of the sensation, one of the true spinal marrow: it is an *excited* act, from an appropriate stimulus. This being wanting, the *act* of ejaculation is as impossible as that of deglutition without saliva or other appropriate stimulus of the muscles of the pharynx.

95. Gregory, speaking of this act, observes—"ita ut totum genus nervosum mirum in modum convellat, musculosque *levatores ani* dictos ad contractionem cieat, &c. &c. and adds "semen" in urethram "effusum novum dat stimulum cui musculus *accelerator* paret, in reddenda urina voluntarii motus, in expellendo semine inviti motus, organum." &c.

96. The same elegant writer adds,—"Neque solus accelerator musculus convellitur; levis plerumque tremor aut convulsio, abliquando vero vehementissima convulsio omnium musculorum in Venere observatur; hinc anhelatio, palpitatio, syncope, *epilepsia* nonnunquam, vel demum subita mors, quæ nonnullos Venere occupatos, nec tale quidquam timentes abripuit."*

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* Conspectus Medicinæ Theoreticæ, cap. xxi, § DCCLVIII.

97. I observed, in the paper already mentioned, that there is but a step, as it were, from the normal affection of the nervous, muscular, and respiratory systems, in that circumstance, to an attack of epilepsy itself. Hippocrates is said to have observed.—την συνουσιαν ειναι μικραν επιληψιαν.

98. On the other hand, there is, in epilepsy, as I have stated, frequently an action of the ejaculatores.

99. The whole of these phenomena lead us to interesting veiws, both of this act and of this disease. Both are, primarily, affections of the excito-motory system. A patient, mentioned by M. Brachet,* perfectly paraplegic, and destitute of all sensation below the loins, became a father; the συνουσια is described as being "sans sensation," "sans secousse." Its influence was *limited* by the disease.

100. With these remarks I must conjoin one or two observations respecting the connection of the uterus with the excito-motory system. Every one is aware of the effect of conception in inducing vomiting, and of the fearful attacks of convulsion which sometimes supervene at a later period of pregnancy, and during, or after, parturition. One patient, on the other hand, subject to epilepsy, lost the attacks during the whole period of pregnancy! The very act of parturition, inscrutable as it is, seems, with abortion, to be one of the excito-motory system.

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* Recherches du Système Nerveux Ganglionaire, p. 238, 248.

101 As a final remark, I must mention the singular influence of the *passions* over these and *all* the functions of the excito-motory system. Sickness; panting; convulsions; relaxation of the sphincters;—these, and a thousand other affections of this system, are induced through the mysterious influence of disgust, fear, &c. Infantile convulsions and epilepsy are renewed by vexation, &c.

102. The condition of the larynx and of the respiratory motions affords an important diagnosis between epilepsy and hysteria. In the former the larynx is usually closed with forcible expiratory efforts; in the latter it is open, with heaving, sighing breathing.

103. In one case of epilepsy, my patient, who was musical, lost the power of singing the higher notes after each attack. It is well known how frequent loss of voice is also in hysteria. In hysteria, however, we have rarely, if ever, a bitten tongue.

104. A terrible disease of this order, is tetanus. All the symptoms of tetanus sometimes arise from disease within the spine. This ought to be termed *centric* tetanus. Far more frequently the cause is seated externally, in the course of some of the excitor nerves of the system. A nerve included in a ligature, or lacerated in a wound, may prove the *eccentric* seat of tetanus. In both cases it is plain that it is the excito-motory division of the nervous system which is involved in the disease.

105. To show you how little this subject has been understood, I will adduce one fact especially. Even Mr. Swan, than whom few have dissected the nervous system with greater success, imagines that tetanus may have its seat in the ganglionic or sympathetic system of nerves.* Mr. Swan observes—" I have been induced to inquire how the body is usually affected after accidents. From that inquiry I have been led to state, that when a severe injury has been received, the ganglia of the sympathetic nerves become irritated, and consequently the parts to which they distribute nerves." The irritation " may be communicated to many of the cerebral, and all the spinal, nerves, and from these to the spinal chord; thus producing tetanic spasms, spasms varying according to the part of the sympathetic nerve most affected, as well as the extent and complexity of the irritation."

106. It is difficult to conceive how the sympathetic could either be affected by the cause, or produce the symptoms of tetanus; its functions are interstitial, not obvious to our senses, seen only in their *effects*. It is plain, on the contrary, that the real state of this disease is that portion of the nervous system which I have distinguished from the rest, and designated the excito-motory. Tetanus may be produced at will in the frog or salamander, by applying strychnine to the skin. If

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* A Treatise on Diseases and Injuries of the Nerves, 1834; p. 325, &c.

the head be moved, the frame is still tetanic. If any portion of the spine,—if even the tail of the salamander be separated, it exhibits all the phenomena of perfect tetanus! These cease on destroying the caudal portion of the spinal marrow, by means of a fine needle. If in the decapitated turtle you lay bare certain nerves, and pinch them continuously with the forceps, you immediately induce a state of tonic contraction of the muscles of all the four extremities, and of the tail. This experiment is the very *type* of tetanus, and leaves *no* doubt what particular part of this nervous system is affected in this disease.

107. I have scarcely time to say a word about hydrophobia. But consider how this disease is induced; what symptoms present themselves; what parts, what functions, are involved; and you cannot fail to fix upon the particular division of the nervous system affected in this most terrible of maladies.

108. I must hasten to conclude this lecture. Allow me to say one word respecting vomiting. This act may be excited by disease within the cranium, by irritation of the fifth in the fauces,—of the pneumo-gastric in the stomach, the gall-duct, the ureter,---of the spinal nerves of the cervix uteri. This familiar phenomenon combines the excitor nerves and motor nerves of respiration, into one system.

109. On the other hand, dentition produced strangury and tenesmus,---symptoms of calculus,

—in the little boy of a friend of mine; symptoms which ceased on freely lancing the gums.

110. In one case, extreme spasmodic stricture of the sphincter ani was produced by the unsuspected presence of a calculus in the urethra. There is no more common event than retention of urine from passing a ligature round a hæmorrhoidal tumor. In *all* these various cases, an excitor nerve is irritated; the irritation is carried to the medulla oblongata or spinalis, and reflected upon the muscle, or system of muscles, excited to spasmodic action.

111. The time does not now admit of my adducing more facts of this kind. Before I conclude, however, I must lay before you some facts of another description.

112. First, disease of the meninges and of the brain, induce spasmodic actions. How is this explained? I think upon the principles of irritation and counter-pressure. The first *may* act through the medium of the nerves distributed to the membranes,---as the recurrent of the fifth of Arnold. In reference to the second, I may adduce several valuable facts. In an interesting case most anxiously watched, and accurately detailed to me, by my friend Mr. Toogood, of Bridgewater, of a little girl, aged thirteen months, the croup-like convulsion occurred repeatedly, until one day, when the bones of a cranium separated, the convulsion then ceased; in a case of spina-bifida related to me by Mr. Herbert Evans, of Hampstead, there was a croup-like convulsion whenever the little

patient turned, so as to press upon the tumor. In the case of anencephalous fœtus, described by Mr. Lawrence, convulsion was produced on pressing on the medulla oblongata. In a case of meningitis given by Dr. Abercrombie,* the anterior fontanelle became very prominent; pressure upon it induced convulsion. Hypertrophy of the brain affords an argument of the same kind: it induces convulsion, except in the case in which the cranium grows with the encephalon. These and other facts lead me to think that convulsion arising from cerebral disease, is thus to be explained.

113. And now, an interesting case presents itself. What is the rationale of convulsion from excessive hæmorrhagy? It struck me that this question might be resolved by experiment. I went to the house of a butcher, and begged to see a sheep killed. The usual mode of doing this is, first to divide the spinal marrow, and then open the large vessels. At my request, not only the spinal marrow, but the entire neck, was divided, the head being separated from the body with the exception of the skin: the blood-vessels were then divided. I watched the effect of the flow of the blood. After a certain hæmorrhage had taken place, the animal was violently convulsed. The convulsion could only be *spinal*.

114. One final word upon the pathology of the

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* On the Brain and Spinal Chord, Sect. iv. § 5.

external portion of the ganglionic system. I think it probable that many of those cases in which *one* limb of an infant ceases to grow, are cases in which the disease is seated in the posterior spinal nerves leading to the part—probably at or near their origin. This conjecture must be confirmed by the careful post-mortem examination of such cases. It may possibly admit of being illustrated by experiment.

115. I beg to observe that I shall, in future lectures, treat of these subjects in their turn, and, as usual, in a perfectly *practical style*, from which the present lecture must be viewed, in some degree, as a deviation.

IV.—THE THERAPEUTICS OF THE NERVOUS SYSTEM.

116. Excitement in the cerebral system may be much diminished by a due attention to seclude the patient from the light, from noise, from every kind of mental disturbance. To this branch of our subject belongs to the whole of the *moral* treatment of the insane, as it has been termed.

117. In reference to the true spinal or excito-motory system, much more may be done.

118. Strychnine obviously excites this system; whilst the hydrocyanic acid as obviously diminishes its powers. These two remedies may, therefore, have appropriate applications. But I have

seen them sadly misapplied. What do you think, for instance, of strychnine as a remedy for hydrophobia? Would you not as soon give the hydrocyanic acid in the paralysis of colica pictonum?

119. The carbonate of iron and the liquor arsenici are other remedies, the powers of which are only partially explored. They cure chorea.

120. Then we have an important remedy in electricity and galvanism. Have its powers been *appropriately* applied?

121. Another important remedy, in the class of true spinal affections, is the dashing of cold water on the face, or surface. This remedy tends to open the larynx in epilepsy, and to convert the violent *expiratory* struggles into acts of inspiration.

122. Another agent which has great influence upon the excito-motory system is change of air: this is observed in the later stages of pertussis, the croup-like convulsion, &c.

123. Another view of this subject, and a most important one, is the removal of all the *causes* of morbidly excited states of this system. In the convulsions of infants we remove the causes of irritation in the gums, the stomach, the bowels &c. and in the epilepsy of adults we adopt similar plans.

124. But I suspect there are many regions uncultivated, unexplored, in this field of investi-

gation. May not counter-irritation be applied more extensively along the spine than hitherto? In a case seen by Mr. Copeland and myself, and already mentioned, § 36, much benefit accrued from the persevering and effectual use of a liniment, consisting of two drachms of liquor potassæ, and of liquor ammoniæ puræ, with twelve of the linimentum saponis. Might not a lotion of the hydrocyanic acid be applied with advantage in some cases of *tonic* spasms?

125. Might not the inhalation of the vapour of this powerful remedy be of service in some spasmodic affections of the respiration, &c.?

126. For a further illustration of my views, I must refer to the treatment of asphyxia in infants, which will be given in the succeeding lecture. I will close these remarks by observing once more, that we have in this part of the subject much still to investigate, especially in the way of experiment.

127. I *must* now conclude. If I have awakened your attention and interest in reference to this important pathological and practical subject, I have done all that I could expect in two short lectures. I have one request to make of you: receive what I have said in a love of the truth; seek not to dispute, but to prove—to confirm or correct my statements. It is some years since I began my inquiries; much, very much, remains to be done. I trust I shall be aided by *you* in the further prosecution of the subject. Be

careful how you observe; remember my words on a former occasion---*fulness*, *accuracy*, *probity*, should be the legible characters written upon every *case*, and the mental and moral characters of every *observer*.

LECTURE III.

CONGENITAL STATES OF THE NERVOUS SYSTEM; ASPHYXIA, ITS REMEDIES, ETC.

128. There is no degree in which imperfection of the nervous system may not exist in the fœtus in utero.

129. There may be complete absence both of the spinal marrow and of the encephalon; in which case the fœtus is termed *amyelous* or *amyelencephalous.* There may be the absence of the encephalon,—of the cerebrum and cerebellum only; in this case the fœtus is designated *anencephalous.* Or the cerebrum merely may be in a state of defective development, or of *atrophy*, more or less partial or extensive.

130. The amyelous fœtus cannot survive the moment of birth. The anencephalous fœtus may support an extra-uterine life for several hours, displaying the interesting spectacle of the phenomena of the true spinal or excito-motory system,

exclusively, in the human subject; but these phenomena gradually cease, or, in other terms, the anencephalous fœtus is not *viable*, the influence of the brain being required, in addition to that of the spinal marrow, for the continuance of life. In the case of atrophy, the fœtus is viable, and may survive for years, but in a more or less idiotic, or paralytic condition; that is, with greater or less defect of the sentient and voluntary functions, according to the degree of atrophy or defect of the encephalon.

131. I need not adduce any examples of the amyelous *fœtus*, which is always anencephalous too, and generally affected with spina bifida. It affords no illustration of events which occur in extrauterine life,—or disease.

132. Of the anencephelous fœtus we have most interesting accounts by Mr. Lawrence, M. Lallemand, M. Ollivier, &c.

133. The description of the phenomena presented in such a case, witnessed and recorded* by Mr. Lawrence, is as follows: "The child moved briskly at first, but remained quiet afterwards, except when the tumour was pressed, which occasioned general convulsions. It breathed naturally, and was not observed to be deficient in warmth, until its powers declined. I regret that, from a fear of alarming the mother, no attempt was made to see whether it would take the

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* Medico-Chirurgical Transactions, vol. v, p. 166.

breast: a little food was given it by the hand. It voided urine twice in the first day, and once a day afterwards: it had three dark-coloured evacuations. The medulla spinalis was continued for about an inch above the foramen magnum, swelling into a small bulb, which formed the soft tumour on the basis of the skull. All the nerves, from the fifth to the ninth, were connected to this." This brief detail is full of interest. The respiration was natural, the medulla oblongata being entire. Swallowing was effected when the food was brought into contact with the pharynx; the sphincters performed their functions; the limbs were moved when the skin was first impressed by the atmospheric air. There was no indication of sensation---the child remained quiet after the first brisk movements; and no event is mentioned which could establish the existence of voluntary motion,---the acts of swallowing, and of the expulsion of the urine and fæces, with the functions of the larynx and of the sphincters, belonging distinctly to the excito-motory system.

134. The description of an anencephalous fœtus, given by M. Lallemand,* is equally interesting:---" J'ai vu il y a quatre ans, à l'Hotel-Dieu, un fœtus anencéphale, à terme, ou à peu près, qui vécut trois jours. Pendant tout ce temps il poussa des cris assez forts, exerça des mouvemens de succion toutes les fois qu'il sentit quel-

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* Observations Pathologiques, &c. p. 86.

que chose entre ses lèvres; mais on fut obligé de le nourrir avec du lait et de l'eau sucrée, parce qu'aucume nourrice nevoulait lui donner le sein. Il exécutait des mouvemens assez étendus des membres thoraciques et abdominaux. Quand on plaçait un corps étranger dans ses mains, il fléchissait les doïgts commepour le saisir; mais en général tous ses mouvèmens avaient moins d'ènergie que ceux d'un fœtus de même âge.

135. "Le cerveau et cervelet manquaient entièrement: il ne restait à la base du crâne que la moëlle allongée et la protubérance annulaire, avec l'origine des nerfs pneumo-gastrique, trifacial et optique. Le tout était recouvert par les débris des os du crâne, des méninges et de la peau."

136. A similar case is detailed by M. Ollivier,* who remarks—"J'observai l'enfant anencéphale deux heures après sa naissance. Les yeux étaient constamment fermés; il poussait des cris fréquens qu'on calmait facilement en introduisant le petit doigt dans sa bouche: il exerçait alors des mouvemens de succion répétés; il agitait ses membres avec assez de force, et serrait entre ses doigts les corps qu'on plaçait dans ses mains.

137. "Je le revis ou bout de trois heures. Les pieds et les mains étaient devenus violets et froids; la respiration ne s'opérait plus à des intervalles aussi rapprochés; les mouvemens de la

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*Traité de la Moëlle Epinière, ed. 2, Paris, 1827, p. 156.

moëlle épinière, que j'avais remarqués d'abord, continuaient toujours d'avoir lieu, et suivaient chacune des grandes et longues inspirations qu'il faisait. Les cris étaient moins forts et moins fréquens: on lui donna à diverses reprises de petites cuillerées de vin vieux sucré.

138. Insensiblement le refroidissement des extrémités gagna le reste des membres et le tronc; la respiration s'opérait à de plus longs intervalles; elle devint convulsive. Cet état persista pendant six ou huit heures; ses cris devinrent plus faibles et plus éloignés, de même que les mouvemens de la respiration, qui étaient accompagnée de convulsions générales, et il mourut dans un véritable état d'asphyxie, après avoir poussé un cri analogue à celui qui résulte du hoquet."

139. M. Ollivier adds (p. 161),—"Il n'existait pas ici un seul rudiment de l'encéphale et des prolongemens de la moëlle allongée; la moëlle épinière seule était restée intacte, et cependant cet infant exerçait des succions répétées, et serrait avec assez de force entre ses doigts les corps qu'on placait dans sa main; ces mouvemens étaient loin d'être automatiques comme ceux qui agitaient les membres inférieurs."

140. These cases, in connection with the preceding one, are full of interest. The peculiar cries, which resemble, in their rationale, the croup-like convulsion from dentition; the closed state of the eye-lids; the action of suction excited by the contact of the finger; the closure of the fingers ex-

cited by objects placed in the palm of the hand, and the movements of the inferior extremities in this acephalous infant, are phenomena of the excito-motory system of the most deeply interesting character.

141. The following facts are extracted from a letter adressed by Mr. Sweatman to Sir Charles Bell, and published in the "Nervous System:"* in a case of parturition,—"after the membranes had given way and the liquor amnii had escaped, the midwife on examining found another membranous bag presenting, which she naturally supposed belonged to a second child, and therefore did not interfere. During the passage of this bag under the os pubis, it suddenly burst, and the whole of the brain escaped from the opening, very much smashed, and hanging together only by its membranes. The child breathed with perfect freedom and cried strongly, rolling its eyes about in a wild, staring manner. It moved its lower extremities freely, and that not from spasm, but obviously in obedience to external impressions. There was no motion whatever of the upper extremities.

142. "In this state it remained for about three hours, when all motion in the extremities ceased, the eyes became fixed, and the breathing gradually slower, til lit ceased altogether, just seven hours after the birth of the child. During this time neither urine nor meconium passed, nor had

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* Appendix, p. cxxx i.

there been any hæmorrhage from the vessels of the brain.

143. "On examination, the occipital bone and the posterior part of several of the cervical vertebræ were found wanting, and their place had been occupied by fluid, surrounded by a membranous bag; an instance of spina bifida of the neck. The spinal marrow was perfect.

144. "A somewhat similar case occurred to me about three years ago, when I had occasion, from peculiar circumstances, to remove the brain of a child through the anterior fontanelle. In that instance, about ten minutes elapsed before its birth, yet it drew a deep inspiration, and would have cried had it not been prevented; and the motions of the *lower* extremities continued about half an hour, although the whole of the brain had been removed, and a blunt instrument repeatedly thrust down the foramen magnum."*

145. Such are a few of the facts which prove the presence of a system of excito-motory functions attached to the medulla spinalis, and existing independently of the brain, in the human subject. The excited acts of suction, on stimulating the lips; of deglutition, on stimulating the pharynx, of the closure of the hand†, on stimulating the palm; of the lower extremities, "*obviously in obedience to external impressions,*" are all phenomena of the deepest interest, as illustrations of the system.

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* See a similar case by Mr. Hammond, in the Medico-Chirurgical Transactions, vol. xii, p. 308.

† See particularly § 87.

146. M. Lallemand, who has attended most to this subject, still considers these motions to arise from *sensation!* and yet, singularly enough, considers the *volition* as suspended.* It is impossible to conceive greater confusion of all ideas on this physiological question, than is presented in the following paragraph, which I quote from this author:—"Les mouvemens instinctifs, automatiques, produits *directement* par des sensations, sans intermédiaire de la réflexion, de la volonté, s'observent à toutes les époques de la vie; ce sont eux qui, pendant le sommeil, président à la respiration, replacent des couvertures dérangées, éloignent celles qui sont trop chaudes, fuient une piqûre, un chatouillement, un poids incommode, changent une position devenue fatiguante; le tout sans que le cerveau en ait la moindre conscience."† I could not adduce a more lively proof of the necessity of reconsideration of this subject.

147. What are the movements produced immediately by sensation? There can be no such thing! How can sensation act in inducing motion, except through the medium of volition? It is impossible! And who can confound the *excited* motions of respiration, with the *voluntary* act of replacing a coverlet?

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* Recherches sur l'Encéphale, v. iii, p. 309—312.

† Recherches Anatomico-Pathologiques sur l'Encéphale, et ses dépendences; par F. Lallemand, Lettre 8°, p. 312.

148. There is another remark of M. Lallemand, of which I am compelled to observe, that it is equally unfounded.—"Cette influence immédiate de la moëlle sur les nerfs qui s'y rendent ou qui en partent, va en s'affaiblissant à mesure que celle du cerveau augmente; mais elle ne disparait jamais complètement."* The truth is, that the intellectual functions are daily developed during the first years of life, and *obscure* those of the excito-motory; but the latter are not *enfeebled* during this change, which is one of *superaddition*, not of *substitution*.

149. The account of the phenomena presented by the anencephalous infant, during the few hours of its extra-uterine life, drawn up by one well imbued with the distinction of the functions of the cerebral, or sentient and voluntary, and the true spinal, excito-motory systems, would possess the deepest interest to the physiologist and pathologist.

150. In the cases of atrophy of the cerebrum, sensation, intellect, and voluntary motion, are *superadded* according to the degree of development of the brain. But, in general, there are *insensibility*, *idiocy*, and *paralysis*; and, as the cerebrum is frequently more atrophied on one side than the other, there is usually some *hemiplegic* lameness of the opposite side of the body. There

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*Recherches Anatomico-Pathologiques sur l'Encéphale, et ses dépendances; par F. Lallemand, Lettre 8°, p. 312.

are frequently epileptic attacks, or contractions of the limbs.

151. M. Lallemand observes, that when the superior and inferior extremities are unequally affected, the former are always more paralyzed or contracted than the latter; and that, whenever the paralysis is not complete, the sensibility is less affected than the movements.*

152. Upon this last point I find it necessary, however, again to recur to the want of distinction on M. Lallemand's part, between the movements which result from sensation and volition, and those which belong to the excito-motory system. I shall, the same time, again point out the absolute necessity for attention to this distinction. M. Lallemand observes, "il n'est pas rationnel de chercher, comme on l'a fait, dans une portion quelconque de l'encéphale, un organe distinct pour la perception des sensations, et un autre pour la détermination des mouvemens volontaires." "La question est décidée par les exemples que je vous citais il n'y a qu'un instant, de fœtus privés de cerveau et de cervelet, qui éprouvent cependant des sensations distinctes, et réagissent sur ces sensations d'une manière assez régulière pour serrer un corps placé dans la main, pour embrasser avec les lèvres la mamelon du sein, exercer la succion et la déglutition†"(!).

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* De l'Encéphale, t. iii, p. 317—320.

† Ibid. p. 322.

153. It is plain, from this quotation, that the want of the distinction on which I am insisting, must prove a continual barrier to the progress of physiology, and consequently of pathology.

154. The sensibility must be studied in the senses of smell, sight, hearing, taste, and touch, distinguishing this last carefully from excitation; the intellect must be studied,—in the physiognomy, the gestures, the voice, and articulation; in the alternations of sleep and waking; in the susceptibility of attention to bright objects, toys, amusements, &c.; the voluntary movements, in examples unequivocally distinct from the excito-motory phenomena.

155. In every case of a viable infant I suppose the excito-motory functions will be complete.

156. The external ganglionic sub-division of the nervous system must be carefully examined in every instance of *partial development*, as of an organ, a limb, &c.

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157. I shall close these remarks by a few observations upon *congenital* diseases of the nervous system. They may be divided into those which take place *in utero*, and those which are induced *inter partum*.

158. The former are principally defective development, or atrophy, or destruction of the encephalon or spinal marrow; hydrocephalus, and hydro-rachis or spina bifida.

159. The latter are apoplexy and asphyxia.

160. Of the former class I shall not say more at this moment.

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161. Of the whole number of *still-born* children at the Maternité of Paris, M. Cruveilhier says* that one-third are affected with *Apoplexy*. The *cause* of this affection is most probably the violence inflicted during severe labour. Its *form* is *meningeal*, that is diffused coagula of blood are found between the membranes, especially at the posterior part of the encephalon, and in the ventricles, without rupture of the *substance* of the brain. The symptoms are not to be distinguished from those of feebleness and asphyxia: some infants have lived with these symptoms for one, two, three, or four days; and some may even have recovered altogether. The *prevention* obviously consists in cautiously accelerated delivery; the *treatment* cannot, until the diagnosis is made evident, be distinguished from that of asphyxia.

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162. To *Asphyxia* I will now draw your attention in a particular manner. *Its* prevention and treatment are constantly points of the utmost anxiety to us.

163. The infant is said to be *still-born*. You wait

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* Fasc. xv.

for the establishment of respiration, and this event does not take place. There is a general alarm. You will now, for the first time, see the value and importance, in a *practical* point of view, of the principles of the physiology and pathology of the nervous system, which I have been teaching you. I have told you that *respiration* is an *excited* function; that it belongs to the excito-motory subdivision.

164. In one word, then, all our efforts must be instantly made to *exicte* respiration. Now, what are the *channels* through which this act may be excited? What are the excitors of respiration?—the *fifth*, the *pneumo-gastric*, and the *spinal* nerves!

165. The *fifth* pair of nerves must be excited by *forcibly* dashing cold water on the face,—by stimulating the nostrils by ammonia, snuff, pepper, or the point of a needle.

166. The *spinal* nerves must be excited by *forcibly* dashing cold water on the thorax, the thighs; by tickling or stimulating the sides, the soles of the feet, the verge of the anus.

167. What the pneumo-gastric is, as the excitory nerve of respiration under ordinary circumstances, the fifth and the spinal nerves are, in cases of asphyxia or suspended respiration. The means recommended for exciting respiration through these excitors, frequently induce a sudden act of inspiration which proves the first of the series so essential to animal life.

168. But if these attempts to *excite* respiration through the fifth and spinal nerves, fail, we

must *imitate* this function by artificially distending the lungs, in the hope that, eventually, it may by excited through its wonted channel, the *pneumogastric.*

169. To effect this, the practitioner's lips are to be applied to those of the infant, interposing a fold of linen, and he is to propel the air from his own chest, slowly and gradually into that of the infant, closing its nostrils, and gently pressing the trachea upon the œsophagus. The chest is then to be pressed, to induce a full expiration, and allowed to expand so as, if possible, to effect a degree of inspiration.

170. But it is important, in doing this, that the practitioner himself should previously make *several deep* and *rapid* respirations, and finally a full inspiration. In this manner, the air expelled from his lungs into those of the little patient, will contain more oxygen and less carbonic acid, and consequently be more capable of exciting the dying embers of life.

171. I base this suggestion on an interesting communication by Dr. Faraday, in the London and Edinburgh Philosophical Magazine, vol. iii, p. 241, for October, 1833, to which I have already referred, § 45. It is ascertained that respiration may be suspended longer, as in diving, or in experiments, after such repeated forced respirations, than in ordinary circumstances, from the greater purity of the air in the lungs.

172. If all these plans should be tried in vain, I would strongly advise galvanic or electric shocks to be passed from the side of the neck to the pit of the stomach, or in the course of any of the *motor respiratory* nerves, and their appropriate muscles. No time should be lost in sending for a proper apparatus; but, should the lapse of an hour, or even more, take place before it *can* be obtained, still it should be sent for and tried.

173. When respiration is established, the *face* must still be freely exposed to the air, whilst the temperature of the limbs and body is carefully sustained.

174. In the *midst* of these efforts, it should, in the next place, be the office of two other individuals to maintain or restore the *temperature* of the little infant, by gently, but constantly, pressing and rubbing its limbs between their warm hands, passing them upwards in the direction of the venous circulation.

175. An enema of gruel, at 98° or 100°, or *higher*, with a little brandy, should be administered.

176. As soon as possible, a little warm liquid, as barley-water, at blood-heat, should be given by means of the proper bottle, furnished with leather or soft parchment. A tea-spoon must be used, for fear of choaking. If the infant draws the liquid through its own lips, by its own efforts, there is no danger.

177. Lastly, these various means should be continued or repeated in the most persevering manner.

178. When an infant has been restored from a state of asphyxia, it frequently relapses into a *Secondary Asphyxia*, and is lost.

179. This is a general fact in regard to asphyxia. I put a bird and a mouse into the same bell-glass inverted over water. First the bird, and eventually the mouse, began to gasp. I put them into their respective cages. The bird was dead the next day, and the mouse on the succeeding day.

180. Sir Humphrey Davy experienced a secondary attack after breathing hydro-carbonate. A corporal of the Guards, upon being apparently restored from asphyxia from submersion, was affected with convulsions, and expired.

181. In a case of asphyxia from laryngitis, after the patient had ceased to breathe, the trachea was opened, artificial respiration was performed, and reanimation took place; but the patient expired shortly afterwards.

182. These facts should keep us upon our guard against secondary asphyxia; we should watch our patient and be prepared with all our remedies. We should dash cold water on the face occasionally, and expose the face of the patient to the cool, free, open air; and we should enjoin, in an adult, frequent, full respirations.

183. How interesting would be a series of well-conducted *experiments* upon young animals, with the view of ascertaining, by comparative trials, the degree of efficacy of the various remedies for *Asphyxia!* I have sometimes thought that, if one wire of the galvanic apparatus were properly inserted into the nostril, and the other within the sphincter ani, the shock might have great efficacy.

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184. I cannot conclude the subject of congenital diseases of the nervous system, better than by giving the following interesting case, already noticed § 112, for which I am indebted to Mr. Evans.

185. "On the 2d of November, 1832, I attended in labour the wife of a poor man, who was a plumber, and who, for some time, had been the subject of epileptic attacks. The mother was diminutive and weakly. While the nurse was washing the child, I observed that there was a tumor on the loins, about the size and form of half a French walnut: on examining it, this was found evidently to arise from the hydrorachitis. In a short time the tumor lost its shrivelled state and became distended into a semi-round bag. The child being pretty strong, I resolved to treat the disease by pressure: when, on compressing it slightly, previ-

ously to applying a bandage, I was surprised to find that such pressure was immediately followed by the affection described by Dr. J. Clarke.* Whenever the pressure was applied, a similar effect resulted, and the nurse was obliged to be very careful, in laying the child down, not to allow the swelling to bear any part of the weight of the body; if she did, the severity of the spasm was such as to threaten suffocation.

186. "The tumor became daily more prominent, and its sides thinner, until, after about two months, it appeared as if it would give way. It seemed better now to evacuate the fluid gradually, rather than to allow it to burst: accordingly, a small opening was made with a needle, and the fluid, which was limpid, oozed out constantly without any apparent effect. The child lived until the end of February, when it sank without any definite complaint.

187. "The examination of the body presented nothing deserving of attention.

188. "The name, *Chronic Croup*, given by some authors, is surely most unfortunate; it is often by no means chronic, and has no relation whatever to croup. It is evidently a convulsion of the respiratory muscles; and, in many respects, seems to have an analogy with hooping cough; for instance, the similarity of the hoop, and the

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* See p. 72, &c.

tendency of both to pass into general convulsions, death, &c. The above case seems to throw some little light upon its nature, inasmuch as it proves that pressure upon the nervous centres (perhaps the medulla oblongata) may, under certain circumstances, produce it."—*December* 15, 1834.

LECTURE IV.

ON ENCEPHALITIS, TUBERCULOUS HYDROCEPHALUS, AND HYDROCEPHALOID DISEASES.

189. IN this Lecture I propose to treat of an important *order* of the diseases of the nervous system.

190. I shall have occasion again to draw your attention to my sub-division of the nervous system, into the sentient and voluntary, the excito-motory, and the ganglionic; for the diseases of which I am about to treat, *begin* in the first, and *proceed* to involve the second, and the last, *in their course.*

191. You will now perceive the intrinsic and *practical* importance of these divisions.

192. I must proceed to state that the *cerebral* diseases of infants may be divided into—

I. *Encephalitis.*
II. *Tuberculous Hydrocephalus.*
III. *Hydrocephaloid Diseases.*
    1. *From Intestinal Disorder.*
    2. *From Exhaustion.*

193. Encephalitis is only to be distinguished from the tuberculous hydrocephalus,—1, by our being able to trace it to some external cause, as a *fall*, a *blow*, too frequently concealed by the nurse at the time of its occurrence; 2, by ascertaining the *absence* of the hereditary *predisposition;* 3, by its acuter symptoms, course, &c.

194. Important as the distinction is, therefore, in reference both to the prognosis and treatment, I am compelled to combine the description of these two diseases, pressing upon you the absolute necessity of a strict inquiry into the two points which I have just mentioned.

195. The *earliest* symptoms of encephalitis and of tuberculous hydrocephalus are, then, those which relate to the *cerebral* functions, which are *exalted.* These functions are so slightly developed in infants, that their state of exaltation too frequently passes unnoticed. Yet the phenomena are obvious enough, if there be but a careful observation on the part of the parent or nurse, on whom the duty of noticing the *dawn* of these diseases must devolve.

196. The *first* symptom is an unhappy countenance and manner, a general expression of pain, of suffering, or, at least, of uneasiness: the brows are contracted on exposure to light, on being moved, or disturbed; the temper is fretful in the same circumstance; the head is, perhaps, moved to and fro continually. The infant is only quiet when left in a state of undisturbed repose. Some-

times there is a perpetual moaning, or whining; sometimes a piercing cry.

197. In the *next* place, I must mention the state of *the sleep*. This is broken: and although the little patient is only quiet when let alone during the day, yet its nights are disturbed by restlessness, or starting, and crying. There is, in the midst of all this, a peculiar stupor.

198. There is intolerance of light and of sound. The eye-lids are forcibly closed, the pupils contracted, on approaching the window or a bright light; any sudden noise induces starting, alarm, crying, &c. The skin is also frequently very sensitive to the contact of the fingers of the medical practitioner, as we ascertain on feeling the pulse, &c.

199. It is in vain to speak of *delirium*, for how is this to be manifested in an infant? However, restlessness takes its place, and constitutes an important symptom; and frequently a deceitful sardonic smile plays upon the countenance; or an expression of fear or fright is written there.

200. Unfortunately, these symptoms, although observable enough, usually meet with some hypothesis in the minds of the parent and nurse, and are referred to the stomach and bowels, &c. &c. and much valuable time is usually lost.

201. To the observant physician, they speak another language. A contracted brow, and a contracted pupil, with want of sleep at night, and want of quiet in the day, must never be overlooked.

202. Such are the true *cerebral* symptoms. But these are frequently allowed to proceed until some far more formidable symptom, belonging to the *excito-motory* system, supervenes. The *most frequent*, and the least formidable in appearance, amongst this second series of symptoms, is *vomiting*. Never, never, allow vomiting in an infant to pass without paying the utmost attention, and making the strictest inquiry, in reference to the functions of the brain! It is frequently the *first* symptom *noticed*, of encephalitis or of hydrocephalus.

203. The next symptom belonging to the excito-motory division of the nervous system, is *strabismus*, a *contracted* state of the muscles of the *thumb* or *fingers*, or some unequivocal *spasmodic* or *convulsive* affection of the *respiratory* muscles, or of the muscles of the *limbs*. No one *can* see the least of these things without the most extreme alarm.

204. These symptoms, from being apparently slight and transitory, become continuous and severe: the eye is affected with strabismus, or is turned obliquely upwards, by the *tonic* action of the abducens, or the pathetic; or there is a rocking, or rotatory, motion of the eye, by the *clonic* action of the same nerves and muscles. The thumb is drawn spasmodically into the palm of the hand, and the fingers are closed over it; the toes are contracted towards the sole of the foot; and the arms are frequently affected with rigidity. There are *fits*, with spasmodic croupy inspira-

tions, from contraction of the glottis and action of the muscles of inspiration; or there are general *convulsions.*

205. The bowels are obstinately constipated.

206. These two states of cerebral and true spinal symptoms mark two distinct degrees of violence of this terrible malady.

207. The third state is denoted by coma, and its concomitant diminution of the faculties of the sentient and voluntary system, and eventually of the powers of the excito-motory system.

208. There are blindness, deafness, deep stupor, the absence of voluntary motions. At the first, the eye-lids are constantly half-closed, but *still* close completely on touching the eye-lash; afterwards, this excito-motory phenomenon ceases. The respiration becomes irregular,—alternately *suspended*, and *sighing*,—and, at length, stertorous. The sphincters lose their power, and the fæces and urine are passed unconsciously.

209. The countenance is alternately slightly pale and slightly flushed, at the first; afterwards it is pale and emaciated.

210. The general surface is, like the countenance, cool, shrunk, and emaciated, in later periods of the disease.

211. The pulse, which is slow at the first, becomes gradually more and more frequent and feeble, until, towards the close of the disease, it is counted with difficulty.

212. The tongue is white and loaded.

213. The secretions are morbid: the alvine evacuations dark-coloured and fœtid.

214. How interesting and valuable would a series of cases be, taken in the rigid spirit of truth, and of the divisions of the nervous system into the cerebral, the true spinal, and ganglionic!

215. The morbid anatomy of encephalitis consists in the effusion of serum and of lymph under the arachnoid, and of serum into the ventricles, and in softening of some part of the cerebral mass. Of the latter change I saw an interesting case a short time ago, in a child of two years of age.

216. The morbid anatomy of tuberculous hydrocephalus consists of the effusion of serum into the ventricles, and under the arachnoid at the summit, but especially at the base of the brain. M. Rufz has recently called the attention of the profession to peculiar, minute, white, semi-transparent granulations, formed in the arachnoid, especially at the base of the brain. Tubercles occurred in the cerebrum or cerebellum in thirteen cases out of twenty-seven in which these granulations were observed by M. Rufz. The spinal marrow and its membranes, examined in twelve cases, were found free from morbid change.

217. The connection between the hydrocephalus and strumous affections has been long noticed. M. Rufz, in his interesting Thesis, states, that tubercles of the lungs occurred in *every* case examined after their frequent coincidence with hydrocephalus had been distinctly ascertained. Granulations were observed in other organs, the

lungs, the pleura, the peritonæum, the liver, the kidneys.

218. The treatment of encephalitis and of hydrocephalus in the *early* stage, and especially of encephalitis, must be energetically antiphlogistic.

219. Blood-letting, general and local, must be adopted in its fullest measure. The child should be placed in the perfectly erect position, and the jugular vein should be opened, and the blood be allowed to flow until the lips turn pale. Afterwards, venesection, cupping, or leeches, should be employed and repeated, according to the age and strength of the little patient, and the period and violence of the disease.

220. The bowels should be freely purged

221. The system should be brought under the influence of mercury as promptly as possible, by means of calomel, or the hydrargyrum cum cretâ, and the unguentum hydrargyri.

222. The head should be kept high, and bathed with a spirit lotion, or covered with a bladder, partly filled with pounded ice.

223. The feet should be fermented with hot water frequently, and kept warm.

224. The diet should consist of barley-water.

225. Every source of excitement or of disturbance should be carefully removed.

226. Later in the disease, counter-irritation by blisters applied to the head, or the neck; mercury; a more nutritious diet; and continued fomentations of the feet, may be tried.

227. I must not dismiss the subject of ence-

phalitis and of hydrocephalus without reminding you of the comatose and convulsive affections which occasionally supervene to acute anasarca, especially that which follows scarlatina, in children. The most prompt and energetic use of the lancet is the only remedy in this case.

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228. How different, how opposite, is the treatment of the cases which I must next bring before you, viz. the hydrencephaloid diseases! how important, how necessary, therefore, is the diagnosis between them.

229. I first gave a cursory sketch of this morbid affection in a little volume of "Medical Essays," published in 1825, but now out of print. It has since been briefly noticed by Dr. Abercrombie, in his valuable "Researches on Diseases of the Brain and Spinal Chord," published in 1828. I read an Essay upon it at the Medico-Chirurgical Society, on the ninth of December, 1828. Lastly, Dr. Gooch has treated of this affection in his excellent "Account of some Diseases peculiar to Women," published in 1829. These are all the notices I have hitherto seen of this singular and interesting disorder.

230. The credit of having first distinguished this disease from hydrocephalus, has been given to Dr. Abercrombie and to Dr. Gooch. These dates will, however, settle the questions both of priority and originality.

231. The hydrocephaloid disease depends principally upon exhaustion. This exhaustion has its origin in early infancy, chiefly in diarrhœa or catharsis; in the later periods of infancy, in the loss of blood, with or without the relaxed or evacuated condition of the bowels.

232. The state of diarrhœa has generally depended upon improper food, or intestinal irritation. It has very frequently succeeded to weaning, or to other changes in the diet, or to constipation. The catharsis has followed the administration of an aperient medicine, which, at such a moment of disorder of the stomach and bowels, is apt to act excessively. The exhaustion from loss of blood generally follows the inappropriate, or undue, application of leeches, or the use of the lancet.

233. I may observe, indeed, in this place, that of the whole number of fatal cases of disease in infancy, a great proportion occur from this inappropriate or undue application of exhausting remedies. This observation may have a salutary effect in checking the ardour of many young practitioners, who are apt to think that if they have only bled, and purged, and given calomel enough, they have done their duty; when, in fact, in subduing a former, they have excited a new disease, which they have not understood, and which has led to the fatal result.

234. This question, and that of the effects of exhaustion in infants and children, open a new

field of investigation. Almost all our works on infantile diseases are silent on the subject; and yet without an accurate knowledge of it, I regard it as totally impossible that we should be prepared to watch and treat the morbid affections of this young and tender age. The subject must be taken up and investigated anew. All the affections which may arise from exhaustion, must be accurately observed, distinguished from similar affections arising from other causes, and traced back to their origin, and forward in relation to their remedies. In this manner some *hydrocephaloid*, *convulsive*, and even *croupy* affections will be viewed in a new aspect; and we shall be preserved from some painful dilemmas into which we should assuredly fall without this knowledge of the effects of exhaustion.

235. This affection may be divided into two stages; the first, that of irritability; the second, that of torpor. In the former there appears to be a feeble attempt at re-action; in the latter the powers appear to be more prostrate. These two stages resemble, in many of their symptoms, the first and second stages of hydrocephalus respectively.

236. In the first stage the infant becomes irritable, restless and feverish; the face flushed, the surface hot, and the pulse frequent; there is an undue sensitiveness of the nerves of feeling, and the little patient starts on being touched, or from any sudden noise; there are sighing, and moaning during sleep, and screaming; the bowels are flatulent and loose, and the evacuations are mucous and disordered.

237. If, through an erroneous notion as to the nature of this affection, nourishment and cordials be not given; or if the diarrhœa continue, either spontaneously, or from the administration of medicine, the exhaustion which ensues is apt to lead to a very different train of symptoms. The countenance becomes pale, and the cheeks cool or cold; the eye-lids are half closed, the eyes are unfixed, and unattracted by any object placed before them, the pupils unmoved on the approach of light; the breathing, from being quick, becomes irregular and affected by sighs; the voice becomes husky, and there is sometimes a husky teasing cough; and, eventually, if the strength of the little patient continue to decline, there is crepitus or rattling in the breathing; the evacuations are usually green; the feet are apt to be cold.

238. A similar train of symptoms occurs in other cases, in which the strength of the little patient has been subdued, and the vascular system exhausted by the abstraction of blood. In both cases leeches are sometimes again applied to subdue this new form of disease, under the erroneous notion of a primary cerebral affection. This measure infallibly plunges the little patient into imminent, if not irretrievable danger.

239. Sometimes the sinking state goes on in spite of every appropriate remedy.

240. Stimuli, if efficacious, reduce the frequency of the pulse, and restore the wonted warmth, colour, expression, and smiles to the countenance.

241. The condition of the cheeks, in regard to colour and warmth, may be considered as the pulse of very young infants, indicating the degree of remaining power, or of exhaustion. In the present case, especially, there is no symptom so important, so distinctive. It is from the condition of the cheeks, in conjunction with a due consideration of the *history*, that the diagnosis of this morbid state, and the indication of the appropriate remedies, are chiefly to be deduced. The general surface, and especially the hands and feet, also afford important sources of information as to the condition of the nervous or vital powers. Next to these, the degree of frequency of the pulse, and the character of the breathing, are points of the greatest importance;—during the stage of irritability the breathing is quick; during that of torpor, it is slower, irregular, suspirious, and finally crepitous; the pulse changes in its beat, from being full becoming smaller, but retaining, perhaps, its former frequency.

242. We should be especially upon our guard not to mistake the stupor or coma, into which the state of irritability is apt to subside, for the natural sleep, and for an indication of returning health. The pallor and coldness of the cheeks, the half-

closed eye-lid, and the irregular breathing, will sufficiently distinguish the two cases.

243. This brief sketch of the symptoms in this interesting infantile affection is taken from an essay published upon the subject some years ago. I have recently had a most interesting opportunity of observing the symptoms in an extreme case, although followed by perfect recovery.

244. The patient, a little boy, aged 4, became comatose and perfectly blind and deaf. The finger might approach the half-closed eye, without inducing any movement; but the moment it touched the eye-lash, the eye-lids closed. A spoon applied to the lips excited their action, and the fluid it contained was conveyed into the pharynx and swallowed. The respiration was frequently suspended; a sigh and frequent respiration followed. The cerebral functions had ceased; the true spinal functions remained!

245. In another case, of a little girl, one year old, the eye-lids ceased to close, even when the eye-lash or the eye-ball was touched. Yet recovery took place under the prompt and efficient exhibition of stimuli.

246. The remedies for this morbid affection, are such as will check the diarrhœa, and afterwards regulate the bowels, and restore and sustain the strength of the little patient. With the first objects, it may be necessary to give the tinctura opii, and chalk, and afterwards the pilula hydrargyri, rhubarb and magnesia; with the second, sal volatile, but especially brandy, and

proper nourishment are to be given according to circumstances. But, in this, as in so many cases of infantile disorders, the young milk of a young and healthy nurse, is the remedy of most importance,—in the absence of which, ass's milk may be tried, but certainly not with the same confident hope of benefit.

247. Five or ten drops of the sal volatile may be given every three or four hours; and twice or thrice in the interval, five or ten drops of brandy may be given in arrow-root done in water. As the diarrhœa and the appearances of exhaustion subside, these remedies are to be subtracted; the bowels are to be watched and regulated, and the strength is to be continually sustained by the nurse's or ass's milk. The brandy has sometimes appeared to induce pain; sal volatile is then to be substituted for it; a dose of magnesia has also appeared to be good.

248. For the state of irritability, the warm bath is a remedy of great efficacy. For the coma, a small blister or sinapism should be applied to the nape of the neck. A state of exhaustion of the general system, as I have observed elsewhere,* by no means precludes the possibility of real congestion of the brain. It rather implies it. In extreme cases, there are not only the symptoms of cerebral congestion during life, but effusion of serum into the ventricles of the brain is found on examination after death.

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* Commentaries on Diseases of Females, passim.

249. In every case the extremities are to be kept warm by flannel, and the circulation should be promoted in them by assiduous frictions. It is of the utmost importance carefully to avoid putting the little patient into the erect posture. A free current of air is also a restorative of the greatest efficacy.

250. My remarks upon this affection must nenecessarily be brief. I beg to refer you for further information to an Appendix to my Researches on Blood-letting, which you will find in the library. In my next lecture I shall proceed to treat of the convulsive diseases of infants and children.

LECTURE V.

ON THE CONVULSIVE DISEASES OF INFANTS; ON PARALYSIS; ETC.

251. I NOW come to speak of the diseases of the true spinal or excito-motory system; for such I believe *all* convulsive diseases to be. § 89.

252. I have already alluded to the subdivision of these diseases into those of *centric*, and those of *eccentric*, origin. § 90.

253. The convulsive diseases of *centric* origin arise—

1. From *counter-pressure* in diseases, or
2. From *contre-coup* in injuries, of the encephalon;
3. From *irritation* in diseases of the *meninges*, or at the *base* of the brain;
4. From diseases of the spinal marrow itself, or of the membranes;
5. From *exhaustion*.

254. It is in this manner that we explain the occurrence of convulsions in encephalitis and hy-

drocephalus, in meningeal or other affections of the base of the brain, or of the spinal marrow, and the effects of extreme exhaustion. Compare § 112 and § 113. In a word, convulsions belong to the *later periods*, and the *close*, of *all* the diseases of the nervous system, as, on the other hand, repeated convulsions eventually affect the encephalon.

255. It will be readily admitted that these points constitute fresh subjects for inquiry and investigation. My present object is, however, different; for I propose to devote this lecture to the consideration of the cases of convulsion from causes acting in the course of the excitor nerves, and, consequently, in parts *eccentric* from the brain and spinal marrow.

256. These causes are principally—

1. *Dental Irritation* acting through the *fifth*,
2. *Gastric Irritation* acting through the *pneumogastric*, and
3. *Intestinal Irritation* acting through *spinal*, nerves.

257. Besides these especial causes, there are others, which act upon the nervous centres; passion, or vexation, and certain odours are of this class; and, singular as it may appear, the state of sleep *predisposes*, at least, to attacks of convulsions.

258. It is interesting to observe how the various

symptoms in the convulsions of infants are affections of the excito-motory functions.

259. Amongst the most frequent of the symptoms is *strabismus;* in a second case we may have contraction of the thumb and fingers, of the wrists, and of the toes and feet; next comes that affection of the *larynx* and of the muscles of *inspiration*, which has been so well described by the late Dr. John Clarke as a "peculiar species of convulsions;" in other cases the *larynx* is actually *closed*, and there are violent convulsive *expiratory* efforts; in the fifth case there is an affection of the *sphincters* of the bladder and intestine, even leading to the idea of calculus. Compare § 38, &c.

260. One or more of these symptoms, or a sardonic smile, leads to a general *convulsion.*

261. Strabismus is the first of the symptoms which I have enumerated. Like the rest, it is sometimes acute, sometimes chronic in its character. The eye is turned inwards, most frequently, sometimes obliquely. The strabismus is variable, obviously augmented by teething, improper food, constipation or fret of the bowels, &c. and it is relieved by relieving these states of irritation. It is equally obviously increased by nervous agitation, by calling the muscles into greater action than usual, &c.

262. Very similar to the undue action of the muscles of the eye inducing strabismus, is that of the muscles of the fingers and toes, inducing

clenched hands and contraction of the feet. This affection is noticed by Underwood and Clarke, and particularly by the late Dr. Kellie of Leith; the last-named writer published a paper expressly upon it.* It is augmented by causes similar to those which augment strabismus. It is, like strabismus, apt to assume a chronic character, and it always constitutes a symptom portentous of other forms of spasmodic or convulsive affection.

263. The peculiar convulsion described by Dr. Underwood, and especially by Dr. John Clarke, must next be noticed. Dr. Underwood describes it as combining a little blueness of the lips, slight turning up of the eyes, *a peculiar sound of the voice* (somewhat like *croup*), and a very quick breathing at intervals, frequent by coming on during sleep ,on any exertion of the body, or transient surprise.†

264. Dr. J. Clarke's description of this disease is highly interesting: he observes—

265. "This convulsive affection occurs by paroxysms, with longer or shorter intervals between them, and of longer or shorter duration in different cases, and in the same case at different times.

266. "It consists in a peculiar mode of inpiration, which it is difficult accurately to describe.

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* Edinb. Med. and Surg. Journ.

† See the Edition of 1835, p. 41.

267. "The child, having had no apparent warning, is suddenly seized with a spasmodic inspiration, consisting of distinct attempts to fill the chest, between each of which a squeaking noise is often made; the eyes stare, and the child is evidently in great distress; the face and extremities, if the paroxysm continues long, become purple, the head is thrown backward, and the spine is often bent, as in opisthotonos; at length, a strong expiration takes place, a fit of crying generally succeeds, and the child, evidently much exhausted, often falls asleep.

268. "In one of these attacks a child sometimes, but not frequently, dies.

269. "They usually occur many times in the course of the day, and are often brought on by straining, by exercise, and by fretting; and sometimes they come on from no apparent cause.

270. "They very commonly take place after a full meal, and they often occur immediately upon waking from sleep, though, before the time of waking, the child had been lying in a most tranquil state. As the breathing is affected by these paroxysms, the complaint is generally referred to the organs of respiration, and it has been sometimes called chronic croup; but it is very different from croup, and is altogether of a convulsive character, arising from the same causes, and is relieved by the same remedies as other convulsive affections.

271. "Accompanying these symptoms, a bending of the toes downwards, clenching of the fists, and the insertion of the thumbs into the palm of

the hands, and bending the fingers upon them, is sometimes found, not only during the paroxysm, but at other times.

272. "Clenching the fist with the thumb inserted into the palm of the hand, often exists for a long time in children, without being much observed, yet it is always to be considered as an unfavourable symptom, and frequently is a forerunner of convulsive disorders, being itself a spasmodic affection.

273. "It rarely happens that a child recovers from an attack of this sort, unless the progress of the disorder has been interrupted by a timely application of proper remedies, without a general convulsion. Then the friends become alarmed, and a disease, which had existed for two or three months, is for the first time considered to be important enough to require medical assistance, after all the farrago of popular medicines, such as fit-drops, soot-drops, assafœtida, &c. have been ineffectually applied.

274. "Convulsions of this description seldom, if ever, occur after the expiration of the third year of a child's life, and not often in children which have lived by sucking, till they have teeth, and have never taken animal food till the dentes cuspidati have come through the gums; this, however, is liable to some exceptions."*

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* Commentaries on Diseases of Children, by Dr. John Clarke, Part i, p 86—90.

275. Dr. Merriman observes, "It is by no means an uncommon affection of children, arising generally from *improper feeding*, and close and confined apartments. If timely attended to, the complaint commonly yields to *daily* aperients, so as to produce at least two copious motions; and continued doses of soda, a strong infusion of burnt sponge, with proper attention to diet and regimen. When the head is manifestly affected, cupping glasses behind the ears are required; but when the patient has *cold*, *pale*, *flabby cheeks*, as I have, not unfrequently, observed in this disease, abstraction of blood is rather injurious than beneficial.

276. "*In two cases* of this kind, which were under my care nearly at the same time, *the children died in fits*. They were both opened by Mr. Sweatman, a very skilful anatomist; but *not the slightest appearance of cerebral affection* could be discovered in either of them. The principal deranged structure discovered, was a collection of small glandular swellings in the neck, pressing upon the par vagum."

277. It has been recently attempted, by Dr. Hugh Ley, to found the pathology of this interesting disease upon observations, such as that adduced by Dr. Merriman; but, I think, unsuccessfully.

278. *In the first place*, as far as my memory and judgment serve me, the cases adduced, to support this view, are not cases in point, but, in reality, cases of other diseases.

279. *Secondly*, supposing pressure upon the pneumo-gastric to exist, it would induce totally different phenomena from those actually observed in this disease; and it would not explain the *series* of phenomena which actually occur in it: for,

280. *Firstly;* Such pressure would induce simple *paralysis.*

281. This would, in the first place, affect the recurrent nerve, and the dilator muscles of the larynx; it would induce a partial but *constant* closure of that orifice,—a permanent state of dyspnœa, such as occurred in the experiments of Legallois, or such as is observed to be excited in horses affected with "*cornage*" or *roaring*, as described by M. Dupuy, in his treatise "De la Fluxion Périodique," 1829, p. 117, &c.

282. Secondly, it would induce paralysis of the inferior portion of the pneumo-gastric, with congestion in the lung or lungs, and the well-known effects upon the stomach, of the division of this nerve.

283. *Secondly:* The disease in question, on the contrary, variously designated "*peculiar convulsion,*" "*spasms of the glottis,*" &c. is obviously a *part* of a more general *spasmodic* affection, and frequently, indeed most frequently, comes on in the midst of the first *sleep*, in the most *sudden* manner, receding equally *suddenly*, to return, perhaps, as before, after various intervals of days,

weeks, or even months. Very unlike paralysis from *any* cause!

284. *Thirdly:* It not unfrequently involves, or accompanies, as I have said, *other* affections, *indisputably spasmodic*, as distortion of the face, strabismus, contraction of the thumbs to the palms of the hands,—of the wrists, feet, toes,—general convulsions! sudden dissolution! a series of phenomena totally unallied to paralysis.

285. *Fourthly:* Indeed, the larynx is sometimes *absolutely closed*,—an effect which *paralysis* of the recurrent nerve, and of the dilator muscles, *cannot* effect.

286. *Fifthly;* Paralysis from the pressure of diseased glands would be a far *less curable* disease, a far *less variable* disease, a far *less suddenly fatal* disease, than the croup-like convulsion.

287. *Sixthly:* Almost all recent cases are at once relieved by attention to three or four things: viz. the state, 1, of the teeth,—2, of the *diet*;—3, of the *bowels;* and, 4, by change of *air*;—they are as obviously produced or reproduced by the agency of errors in one or more of these.

288. *Seventhly:* In fact, the croup-like convulsion is a *spasmodic* disease, excited by causes situated in the nervous centres, or eccentrically from them; in a case of spina bifida, already mentioned, a croupy and convulsive inspiration was induced by gentle pressure on the spinal tumor; in cases from teething, the attack has been induced and removed many times, by *teething*,

and by freely *lancing the teeth*; by crudities, and by emetics and purgatives; by change of air; &c.

289. *Eighthly:* There is a series of facts which prove the connection of this disease with other forms of convulsions in children, and with epilepsy in the adult subject.

290. *Ninthly:* In protracted cases, congestion and effusions within the head occur as *effects* of this disease.

291. *Lastly:* Innumerable cases of undoubted croup-like convulsion have occurred, in which no enlarged glands could be detected in any part of the course of the pneumo-gastric nerve.

292. But if the contiguity of enlarged glands with the pneumo-gastric have any concern, in any case, in causing this disease, I believe the action is one totally different from that assigned, and not suspected, by the author of this opinion. It is obviously an action upon this nerve, as an *incident*, *excitor* nerve, and not as a mere *motor*, or *muscular* nerve.

293. I must here detail an experiment upon the pneumo-gastric made by Mr. Broughton, but hitherto unapplied to any question in physiology or pathology. The pneumo gastric was laid bare in a donkey, and pinched *continuously* by the forceps: the animal made a sudden act of inspiration and of deglutition. The nerve was divided: the *upper*, or *incident* portion of the nerve was pinched with the same effect as before; the lower

extremity of the nerve was pinched without any effect.

294. I may here, also, refer once more to the interesting experiments of M. Dupuy, p. 130, &c. for a similar fact.

295. In this manner, I conceive, *irritation* of the pneumo-gastric in the neck may have induced the croup-like convulsion. *Pressure* upon this nerve, inducing paralysis of its remote extremity, *could not* possibly induce the phenomena in question.

296. It would be difficult to adduce a more convincing proof of the *pathological* and *practical* importance of the views of the nervous system, which I am laying before you.

297. I venture to *suggest* another view of this matter as nearer the truth: viz. that this disease is induced through the *fifth* pair of nerves in *teething*, the *pneumo-gastric* in indigestion, and *spinal* nerves in constipation, as parts of the excito-motory system. The view itself *points* to the most useful and efficient *remedies*, and this is highly important: it points to the teeth, indigestion, and constipation, as *causes*, and to the well-known means of removing them; it points to the important objects involved in change of air, mental quiet, &c.

298. If, instead of the popular remedy, (the warm bath), the *gum-lancet*, and the full warm water *enema*, were *instantly* administered, many little patients would be saved from the effects of

this terrible disease. The diet should be barley-water only.

299. The respiration is actually arrested by closure of the larynx, there are forcible expiratory efforts only, or principally, in the actual convulsion. This need scarcely be described: the eyes are distorted from their axes; the face is drawn into horrible forms; the mouth is filled with foam; the body and the limbs are variously and shockingly convulsed. The countenance is livid with venous blood, affording an index to the condition of the brain. There is perfect coma, sometimes long-continued. Or there may be sudden dissolution!

300. Sometimes a more transient and partial convulsive movement occurs, like an electric shock. In one deeply interesting case, such a convulsive affection was sometimes ushered in by a sardonic smile. In other moments the little boy was obviously expecting the shock in alarm.

301. In another very interesting case there were strangury and tenesmus, symptoms leading to the suspicion of calculus. The lancing of the gums afforded immediate relief.

302. As in the affection noticed in my last lecture, cerebral disease was described as frequently leading to convulsion; so, in those which I have just mentioned, the convulsion frequently leads eventually to cerebral disease, especially congestion and effusion. The due relation of the

diseases of the cerebral and true spinal subdivisions of the nervous system is plainly seen. Hitherto there has been little but confusion in our views, both of the pathology and treatment of these several diseases.

303. We may now discern that, whilst in the cerebral diseases our remedies were chiefly directed to relieve the morbid condition of the arterial or capillary circulation within the head, in the diseases of the true spinal system, our efforts must be made to remove the cause or causes of these diseases, whilst we guard against their effects; viz. undue venous *congestion* of the cerebrum, and *effusion*.

304. I need scarcely advert to the erroneous views, and, consequently, erroneous mode of treatment, of this affection, of those authors who have considered it as originally an affection of the encephalon. Cause has been mistaken for effect, and effect for cause. The effusion, for example, which is the effect of the previous convulsive struggles, has been considered as their exciting cause. The whole confusion upon this point has arisen from not observing to what subdivision of the nervous system the *first* symptoms belong. I quite agree with Dr. Merriman in condemning as useless, or rather as injurious, the indiscriminate and lavish detraction of blood.

305. The proper mode of treatment comprises the remedies—

1. *Against the Attacks,*
2. *In the Attacks and in the Threatening of the Attacks,*
3. *Against their Effects.*

306. The remedies against the attacks, or the prevention, consists in avoiding all the exciting causes:—dental, gastric, intestinal irritation; passion; vexation; disturbance; interrupted sleep; &c.

307. The remedies in the threatening of attacks consist in the watchful and prompt repetition of the same treatment;—lancing the gums, relieving the stomach and the bowels. The *sleep*, especially, should be watched; and if there be a sardonic smile, or starting, or other symptoms, the little patient must be *gently* awoke, and the remedies just enumerated should be administered.

308. After the gum-lancet, I would advise a copious enema of warm water.

309. If there be great threatening of an attack, I would tickle the fauces, dash cold water on the face, and irritate the nostrils, having the patient placed, as speedily as may be, in the warm bath.

310. To guard against the effects of the attacks, we may deplete the blood-vessels about the head with cupping or leeches; apply an alcoholic lotion constantly all over the head; or, if the case be urgent, the ice-cap.

311. In addition to these measures, the secretions must be corrected, mild mercurials being

given, perhaps to affect the system; afterwards, change of air is of undoubted efficacy; and a very mild tonic plan may be added with advantage, as minute doses of the sulphate of quinine, of the carbonate of iron, &c. Sponging with *warm* salt and water is also a valuable auxiliary remedy.

312. It is impossible to misconceive the vast importance of this subject. If any thing could add to this importance, it is the fact that the convulsions of infancy frequently lay the foundation of epileptic attacks in youth or adult age. Sometimes the transition is so gradual and continuous, that the two affections are proved to be obviously the same.

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313. Another disease belonging to this department of the pathology of the nervous system is *Pertussis*, or chin-cough (quasi *chine*-cough). Pertussis in children and asthma in adults are decidedly affections of the true spinal or excito-motory system. Like the other affections of this system, pertussis leads to convulsion, and to effusion into the cerebral ventricles. And I really believe that some of those cases which have been recently published, as examples of croup-like convulsion from the pressure of enlarged cervical glands upon the pneumo-gastric, were actually cases of pertussis.

314. It must be acknowledged that the cause of pertussis is still hidden from us, and that the disease itself is veiled in mystery.

315. I shall conclude this lecture by calling your attention to a case not hitherto well known to the profession, viz. *Paralysis* from *Dental Irritation.*

316. A little girl, aged twenty months, was taken, when suffering from dentition, with loss of the power of elevating the right arm,—that of closing the hand remaining. There was no other symptom of cerebral affection. The suffering from dentition was undoubted. I therefore concluded that the case was one of paralysis from teething.

317. The gums were freely lanced, the bowels well moved, the diet strictly regulated; and, *for fear* of hidden disease within the head, two leeches were applied. An embrocation was prescribed for the arm.

318. A few days after the attack of paralysis, this little girl was seized, in the early part of the night, with a fit of crowing inspiration. This event confirmed *me* in my diagnosis.

319. The event justified the view I had taken. The child recovered *perfectly*, without any energetic remedy being used for cerebral affection, by continued attention to the state of the gums, the stomach, and the bowels; an event which could scarcely have occurred, from such simple measures, had there been such decided affections, arising from cerebral disease.

320. This case was watched with peculiar interest, from the circumstance of its occurring in

the family of a medical friend, Mr. Grant, of Thayer Street.

321. But I will give this interesting case in Mr. Grant's own words:—

322. "M. A. G——, æt. twenty months, has been suffering for some time from dentition, being fretful, and having a cough during the night. This morning, April 30th, 1835, her mother observed that she was incapable of raising the right arm; she retained the power of swinging the arm backwards and forwards, and of bending the forearm on the arm, but had not the least power to raise the arm itself, as if the deltoid muscle only was paralyzed. On examining the arm, the child suffers no pain, and there is not the least reason to believe that any accident could have occasioned this loss of power. The general health of the child, with the exception abovementioned, is excellent; appetite good; bowels are every day relieved.

323. "Dr. Marshall Hall, on seeing the child, recommended a gentle emetic, followed by a dose of castor oil; the gums, over the four eye-teeth, which are all coming forwards, to be carefully lanced every second day; and ultimately, an embrocation to the arm; and a light unirritating diet.

324. "May 7th.—Little alteration in the state of the arm, which the child is perfectly unable to raise in the smallest degree. The castor oil is given every morning, which produces free and

healthy evacuations; the gums have been repeatedly lanced, but the teeth do not advance; she still coughs during the night, but last night she had several fits of coughing, resembling the convulsive crowing of croup; but, as there was no heat of surface, or quickening of pulse, nothing was done. To-day it was considered prudent to apply two leeches to the back of the ear, and have the hair removed from the back part of the head, and the same plan of treatment as before was pursued.

325. "May 14th.—There has been no return of the crowing cough, and the child's general health continues very good. She now evidently has regained some power in raising the arm. Continue the mild diet; occasional doses of oleum ricini, lancing the gums, and the embrocation to the arm.

326. "May 21st.—She daily acquires more the use of her arm. One of the teeth has come up to the surface, and the others are advancing.

327. "June 10th.—She has nearly regained the complete power of her arm; her night-cough is almost gone, and general health improving. The other teeth are not quite through yet: regularity of diet and attention to the bowels enjoined.

328. "August 20th.—The child has been for some time in the country, and has perfectly recovered the use of her arm. The four teeth are

quite through. Up to the present time she has never changed her diet in any way, taking bread and milk for breakfast and supper, and bread-pudding, with a single egg in it, for dinner. Her bowels are so regular that she has required no medicine for some time."

August 20th, 1835.

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329. Before I conclude this subject, and that of diseases of the nervous system in *infants* and *children*, I must very briefly notice a *paralysis* of a different kind.

330. We frequently observe a *hemiplegic* paralysis from defective development of the opposite hemisphere of the cerebrum. See § 150. In this case, *both arm* and *leg*, but chiefly the arm, are involved in the paralysis. But it occasionally happens that *one leg only* is affected with a *partial* paralysis; the limb does not *grow* as the other leg does, but remains thinner and shorter; yet it does grow, so that the paralysis is not complete; and it is moved, only with somewhat less power than the other leg.

331. What is the nature of this partial paralysis? Is it of dental origin? Is it an affection of the spinal marrow, or of its nerves, equally partial? Cases and careful examinations are entirely wanting to determine these questions.

332. I think this subject might be illustrated by the experiment of dividing the posterior or *ganglionic* nerves of the spine, which proceed to the lower extremity, in a very young animal. Sensation with *nutrition* would be lost, or impaired, whilst the muscular power would remain.

333. But sometime the muscular power is entirely paralyzed. You may compare the following interesting case of the son of my friend, Dr. Webster of Dulwich, with one taken from Dr. Abercrombie's able work:—

334. "When my boy was about twenty months old (he is now nine years), he had a fit of illness, connected with dentition, which threatened the brain, and for which I opened the jugular vein and purged him. This took him off his feet; and, very soon after, he had a fall from a rather high crib-bed; but this was not attended or followed by any apparent bad consequences. The child recovered his health; but, for some weeks, he seemed to have almost entirely lost the use of his legs, and, being uneasy about him, several of my medical friends saw him; amongst others, I think, yourself. He gradually, however, began to walk again, but not so steadily as before, as he tottered much in his steps, and was constantly falling over every little object that happened to be in his way, and he had much less command over the left limb than the right. He seemed to walk on his toes. It was not, at first,

ascertained that one leg was more affected than the other; but as he grew up and was breeched, the matter became more apparent; he plainly walked more firmly on the healthy limb, and less so on the lame one, and threw it about more in walking and playing, and rarely set down the heel, except when walking slowly, never when running. He now runs on the toes of that foot, and with a sort of lurch; the limb is less firm, the muscular power is evidently less, but the sensibility seems equal to the other.

335. "I have only to add, that the affected limb is about an inch shorter than the other, which is the reason of his walking on the toes."

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336. "It is now upwards of twenty years since I first saw a girl, aged, at that time, about eighteen months, and previously enjoying excellent health. She had been left for some time sitting upon damp grass, and was immediately seized with fever, accompanied by such a degree of oppression as led to an apprehension of an affection of the brain. These symptoms, however, passed off in a few days, and, upon her recovery from them, it was found that she was entirely paralytic in the right lower extremity. She has, from that time, enjoyed uninterrupted health, and is now a tall and strong young woman; but the

right lower extremity has continued entirely paralytic. It is also a great deal smaller than the opposite extremity, and several inches shorter. All the joints are remarkably relaxed, and the muscles flaccid; but there is no other appearance of disease in any part of it, or in the spine."*

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* Ed. 3; p. 428.

LECTURE VI.

THE NERVOUS SYSTEM AND ITS DISEASES IN ADULT AGE.

337. From infantile to adult age the *cerebral* system undergoes a gradual and progressive development; many of the phenomena of the *true spinal* system are consequently *obscured*. But, I repeat, these latter are only obscured; they are not enfeebled or diminished. In the close of life, the true spinal functions are as energetic and as essential as in its dawn. I have already pointed out the mistake of M. Lallemand in reference to this point: § 148, &c.

338. The functions of the cerebral system—sensation, perception, judgment, volition, voluntary motion, § 34, are gradually developed from infancy to adult age. It is the ψυχη, the animus, the soul, enthroned on organization which becomes gradually more and more perfect. These functions are *physical*. How different from those of the true spinal or mere excito-motory system! By the former, we *feel* external impressions, *per-*

ceive external objects, *judge* of their properties, *wish* and *will* to approach or avoid them, and actually *move* by a *voluntary* effort to or from them. By the latter, when an external object induces an appropriate action in certain muscles, its ingestion into the animal frame is effected or prevented.—without any cognizance of our mind or will, although sometimes with such concurrence, shown by additional voluntary acts: thus, the atmospheric air is inspired, whilst carbonic acid is excluded, without any voluntary, cerebral, or psychical act; the sphincters still act when the organ, through which the soul manifests its faculties, is removed. How extraordinary that these distinctions have never been clearly demonstrated before!

339. The cerebral functions have an interest over those of the spinal marrow; some of these, as respiration, have therefore received the designation of *mixed* functions. The true view of this matter is that which I have just given. They are excito-motory. But volition has an influence over them. The passions, also, have a certain influence over the excito-motory and the ganglionic systems of functions.

340. During *sleep*, the cerebral functions are in a state of repose; but the true spinal functions continue in activity and energy. In *coma*, the true spinal functions become eventually more or less impaired.

341. The true spinal functions appear to be entirely of a *vital* kind, as distinguished from

what is physical or sensorial. They are excited by appropriate stimuli, and preside over the acts of ingestion or egestion. Nothing can be more marked than the distinction between them and the faculties of the soul, to which I have just alluded.

342. I do not wish to press the metaphysical argument beyond its legitimate application. I may, however, add that this is the only view of the subject according to which the *individuality* of the sentient being can be maintained. Does *one* sentient being, when divided, become *two?*

343. Leaving this argument out of the question, the view which I take of the subject, is the only one which enables us to remove the difficulty experienced by Legallois, already noticed, § 85.

344. If another argument were wanting upon this subject, it would be that afforded by the case of M. Brachet, already quoted, § 99, and other cases of a similar kind, in which sensation *was* actually annihilated; and yet the true spinal, excito-motory functions *did* continue. It is preposterous to say there is sensation in such cases. The sphincters, &c. act, therefore, upon another principle.

345. I know, however, that men will dispute. Whilst they are thus unprofitably engaged, I will pursue my investigations. By these, I trust, not only the physiology, but the pathology and treatment, of the diseases of the nervous system, will be promoted.

346. I must now observe that the phenomena of the excito-motory system, like irritability, remain longer, after decapitation, in very young animals, than in animals of adult age. This fact results from Legallois' observations.*

347. I need not repeat that this able physiologist confounded the excito-motory function with sensibility. But, by interpreting his expression of "sensibility and voluntary motion," by that of excito-motory phenomena, his *facts* still remain, and are of great interest and importance.

348. Before I proceed any further with my account of the nervous system and its diseases in adult age, I will present you with a sketch of the arrangement of these diseases I must first divide them, as I have done the nervous system itself, § 11, into

I. *The Cerebral, or Sentient and Voluntary ;*
II. *The True Spinal, or the Excito-motory ; and*
III. *The Ganglionic, the Nutrient, the Secretory, &c.*

349. In our subdivisions of these diseases, we must still be guided by those of the nervous system, given at length, § 15—17, and § 12, to which I must beg to recall your particular attention.

350. I must also recall your attention to the remark which I made in a preceding lecture, § 90, in reference to a division of the diseases of the *True Spinal* system into the *centric* and the

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* Œuvres, Ed. Paris, 1824. p. 90, &c.

eccentric. To these last, a recent statement of M. Andral is extremely applicable :—"Que le nombre d'altérations connues est petit à coté de celui des lésions qu'on ignore! Les cas où, après la mort, on trouve quelque chose d'appéciable pour le scalpel sont les plus communs pour les autres organes; pour le système nerveux, c'est tout l'opposé: les cas ou on rencontre des lésions sont de beaucoup les plus rares. Cette assertion paraîtra paradoxale à ceux qui ne connaissent des lésions nerveuses que les trois ou quatre maladies qu'on observe dans les hopitaux: mais les affections nerveuses se comptent par centaines, et pour ne parler que de ces grandes perturbations qui portent sur le mouvement, sur la sensibilité, sur l'intelligence, où est la lésion dans ces cas? La plupart du temps on n'en trouve aucune, ou celles qu'on observe n'ont aucun rapport avec les désordres fonctionels."

351. Eccentric epilepsy, traumatic tetanus, hydrophobia, &c. &c. leave no unequivocal, uniform traces under the scalpel. The morbid appearances which have been observed, are not constant, but occasional, *effects* of the disease. I shall presently bring before you the observations of M. Gendrin especially upon this point. We must study the *anatomy*, the *physiology*, the *symptoms*; we must distinguish the centric from the eccentric forms of these diseases,—their *effects* from the diseases themselves; and we must add to these points the all-important one of the therapeutics,—the study of the *causes* and

prevention of paroxysms, &c. We shall thus be supplied with all the evidence of which the case admits, and be preserved from the errors of those pathologists who think the gross and brute mass of the morbid anatomy is every thing. We shall also be led to distinguish between curable and incurable forms of the same disease. I heard an amiable physician of Paris contend that epilepsy was invariably incurable. He did not distinguish the *centric* cases of that disease, found in hospitals, work-houses, asylums, &c. from the *eccentric*, so frequently treated, and cured too, in private practice. For your own comfort, and for your patient's benefit, I beseech you to study these things with care.

352. It is interesting to observe how the pathology confirms the physiology and anatomy.

353. The cerebral diseases affect primarily the cerebral functions, and the true spinal functions consecutively The diseases of the true spinal system induce changes in the excito-motory phenomena, in the first place, and in the cerebral functions in the second. The cerebral diseases are generally more insidious in their progress than the true spinal, because slight aberrations of the cerebral functions are less observable than similar affections of the true spinal: pain, vertigo, watchfulness, &c. are less striking than the slightest degree of convulsive movement, or paralytic affection. It is on this account that the *first* symptom *observed* in cerebral disease, is frequently

one belonging to the true spinal system, especially *vomiting*, perhaps *strabismus.*

354. The true spinal diseases, especially those of eccentric origin, affect, in a remarkable manner, the set of functions which I have noticed as belonging to this system: those of the eye and eye-lid; those of the larynx, of the pharynx; the respiration; the action of the expulsors and of the sphincters; that of the muscles designated by the term *tone*. Revolve in your mind the symptoms of epilepsy; of hysteria; of tetanus; of hydrophobia; the causes and phenomena of vomiting, of asthma, of abortion, of tenesmus, and of strangury, and you will be forcibly struck with the justice of this remark. On the other hand, every convulsive effort affects the brain with congestion and its consequences, of which a fatal coma or effusion are not the least frequent.

355. I shall now proceed to describe the individual diseases of the nervous system, beginning with their *causes*, external or internal, and passing on to the *symptoms*, primary and secondary, in their relation to the different subdivisions of the nervous system, the *morbid anatomy*, and the remedies.

I. OF ENCEPHALITIS.

356. Encephalitis must be distinguished into—

1. *Inflammation of the Membranes,*
   1. *Of the Summit,*

        2. *Of the Ventricles,*
        3. *Of the Base,* and
    2. *Inflammation of the substance,*
        1. *Of the Principal Divisions of the Cerebrum; see* § 15.
        2. *Of the Cerebellum.*

357. The former of these might be distinguished by the term *meningitis*, the latter by that of *myelitis*.

358. The causes of encephalitis are mechanical injuries of the head itself,—blows, falls, contre-coups; excessive mental application, anxiety, &c.; the intemperate use of spirits: exposure to the sun-beams; &c. Frequently, encephalitis forms a complication of other diseases of the system, or of distant organs, especially fevers, the exanthemata, and dropsies. It is also frequently the *effect* of other diseases of the encephalon itself; it is excited round the coagulum, or cyst, in cases of cerebral hæmorrhagy,—tumors, tubercles, &c.; it is also sometimes excited by ossifications, or projecting spiculæ of bone. Meningitis and myelitis frequently excite each other. M. Lallemand details a case in which a ligature applied to a part of the *right* brachial plexus induced inflammation and suppuration of the *posterior* part of the *left* hemisphere of the brain.*

359. Encephalitis is said to have followed the suppression of the catamenia and other discharges. Is it ever connected with rheumatism?

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* De l'Encéphale, t. i, 122; 226.

360. The *symptoms* of this disease first manifested, are affections of *cerebral* functions; affections of the *true spinal* and of the *ganglionic* functions, follow in their turn. These symptoms vary much in the *first* and the *later* stages of encephalitis.

361. The *very first* symptoms are affections of the sensibility: the earliest, the most important, sometimes the *only* symptoms, *pain*, or cephalalgia; this is variously situated, not always acute, sometimes excruciating. In addition to pain, there is frequently intolerance of the eye to light, of the ear to sound, and occasionally of the skin to touch; to these are added the sense of flashes of light, or of sudden noises.

362. The *next* symptoms are affections of the mental faculties: sleeplessness, or disturbed sleep, restlessness, delirium—sometimes violent, moroseness, stupor, unwillingness to be disturbed.

363. The *third* source of the symptoms is the volition: there are various voluntary motions, denoting either pain or delirium.

364. Besides these affections of the voluntary movements, there are, in meningitis, spasmodic movements; and in myelitis spasmodic, alternating with, or followed by, paralytic affections, which strongly characterize these different forms of encephalitis.

365. The symptoms which belong to the *true spinal* system are very peculiar: the *first* of these

is *vomiting;* this symptom should therefore never be neglected: the *second* is *strabismus;* the *third* is some decided *spasmodic*, or even *epileptic* attack.

366. The symptoms which belong to the *ganglionic* system are more obscure: the pulse is frequent; the bowels are frequently constipated; but the secretions are little affected.

367. It will assist your memory in reference to the symptoms of encephalitis, to bear in mind the arrangement of the cerebral and true spinal functions, which I have laid before you, § 15—17. I would have you *use* it, however, as Sydenham did his theories; that is, in such a manner that you can cast it from you and give yourselves up to pure observation, when you get into actual practice. Diseases *will not* suit themselves to our plans. Encephalitis, for example, is sometimes marked almost solely by violent delirium, and is then the *phrenitis* of nosologists; sometimes an early, if not the first symptom is convulsion; sometimes there is violent headache as the chief symptom. In other cases this disease is insidious in the highest degree: the patient seems *idle*, perhaps is suspected of *feigning;* he wont move or speak; and there may be *no* other marked symptom! Beware of these things. Cultivate an independent spirit of observation.

368. There is no sypmtom perfectly diagnostic of meningitis and myelitis. The former is more marked by acute pain, delirium, and convulsions;

the latter by muscular contractions, alternating with or followed by paralysis.

369. The second stage of encephalitis is denoted by diminished sensibilities, and mental faculties: the pain and delirium subside into insensibility, stupor, coma; the spamodic into paralytic affections. There may be blindness, deafness; the pupils are generally incontractile on exposure to light.

370. Eventually, the true spinal functions suffer: there is permanent strabismus, difficulty in deglutition, stertor, and other affections of the respiration; relaxation of the sphincters, &c. The pulse varies much in frequency. The bowels are apt to be constipated. Thé urine is often scanty.

371. The insensibility of the patient frequently leads to a particular event. He is unconscious of the existence of a disease, which, under other circumstances, would induce great pain. Complications with encephalitis are, therefore, apt to be overlooked. One event I must point out to you in an especial manner: from insensibility, the patient does not void the bladder; this viscus becomes excessively distended, and there may be a stillicidims urinæ; in *every* case of insensibility, in *every* case of involuntary discharges of urine, examine the hypogastric region!

372. There is another *practical* fact of much importance to which I must draw your attention: not only the dawn and the course of encephalitis are insidious, but its termination is particularly so. In some cases an unexpected state of *sink-*

ing takes place, in which the symptoms, whether pain or delirium, &c. subside, and the patient is thought to be convalescent. The same event occurs in some other diseases, especially enteritis. Beware of this fact too, and suspect some such insidious change, unless *all* the symptoms concur to denote returning health.

373. The principal morbid appearances left by encephalitis are,

In Meningitis.	*In Myelitis.*
1. *Injection.*	1. *Injection; Tumefaction.*
2. *Effusion of Serum.*	2. *Softening.*
3. *Effusion of Lymph.*	3. *Purulent Infiltration.*
4. *Effusion of Pus.*	4. *Abscess, encysted, unencysted.*
5. *Ulceration.*	5. *Induration.*

374. These morbid appearances may take place in various parts of the encephalon. Those left by meningitis occupy the summit and the base of the brain, and the ventricles. Those induced by myelitis occupy the surface and the central parts, and any individual portion or portions of the substance of the brain.

375. For further information upon these important points I refer you, with great satisfaction, to the works of M. Andral and Dr. Abercrombie. The only point to which I would draw your attention particularly, is the fact that the inflamed brain is *tumefied.* This fact explains the occurrence of pressure and its varied effects on differ-

ent parts of the encephalon, frequently situated remotely from the part affected by inflammation, softening, &c. It is on this principle that we explain the occurrence of various affections of the true spinal system in inflammation of different parts of the cerebral system,—the strabismus, the vomiting, the various convulsions which occur in the early stage; and the stertor, the relaxed sphincters, &c. which occur in the later stages of encephalitis.

376. *The treatment* of encephalitis embraces, blood-letting, general and local, purgatives, antimonials, mercurials, cold lotions applied to the head, counter-irritation, &c.

377. The efficacy and safety of blood-letting depend upon its prompt and effectual administration. I believe the *only* satisfactory mode of the institution of this important remedy is that which I have pointed out in my work on Blood-letting. The patient is to be placed perfectly upright, looking upwards, and bled from a good orifice to *incipient syncope.* In this manner alone can we adopt the remedy to the nature and violence of the disease, and the strength of the patient. To *prescribe* a certain quantity of blood to be taken, is a dangerous, indolent, and unjustifiable proceeding,—for it is impossible to know, a priori, what that quantity should be.

378. This mode of instituting blood-letting also guards us against some terrible mistake, and yields an important diagnosis. There are some diseases

so similar to encephalitis, that the most experienced physicians cannot be absolutely certain what a given case may be. These cases would be brought to a fatal issue if the same quantity of blood were withdrawn, as is both proper and necessary in encephalitis. Adopt the rule for blood-letting which I have proposed, and you will be saved from the danger of inefficient blood-letting in the case of inflammation, and of undue blood-letting in the other cases, so similar to it in appearance, yet so different from it in reality! you will also possess an accurate and important source of diagnosis. If it be inflammation, much blood will flow before the lip becomes pale; if it be of the other kind of disease to which I have alluded,---such, for example, as delirium tremens and certain congeneric affections,---very little blood will flow before that event occurs!

379. Topical blood-letting is appropriate in cases in which some symptom or symptoms remain, and we dare not deplete the system further.

380. Purgative medicines, especially the active purgatives,---as the oleum croti tigli,---and nauseating doses of antimonials, are powerful auxiliaries to the other remedies.

381. The free exhibition of mercury, so as to affect the system, is distinctly useful in continued inflammatory affections of some serous and mucous membranes;---as pleuritis, peritonitis, croup; ---and they have been strongly recommended in encephalitis. I had recently a very interesting

case, in which a state approaching to dementia, from meningitis, was cured by a long-continued mercurial course.

382. Ice, an alcoholic lotion, applied to the head, the cold water douche; &c. are other powerful auxiliary remedies. The same remark may be applied to blisters, issues, or setons, applied on some convenient part of the head or in the neck.

383. It is important that the head should be raised; that the feet should be fomented and kept warm. It is important to prevent the patient's mind from being disturbed, or tried, in any way, to keep the eye from the light, the ear from noises, &c.

384. I must in this place recall to your recollection the important remark made § 227. The sudden attack of encephalitis, or it may be pleuritis, or peritonitis, after scarlatina, or rubeola, is fatal, unless it be promptly met by blood-letting in the erect position, to incipient syncope; in effecting which, an extraordinary quantity of blood is withdrawn. I owe much that I know of this affection to my friend Dr. Heming.

LECTURE VII.

II.—ON CONGESTION AND HÆMORRHAGY IN THE ENCEPHALON.

385. I now proceed to bring before you two diseases of the encephalon, certainly not less important, not less frequent, than encephalitis. They are apoplexy and paralysis, or more correctly,—

I. *Congestion, without Rupture*, and
II. *Hæmorrhagy, or Rupture.*

386. These affections, like encephalitis, may occur in—

I. *The Membranes*,
II. *The Substance, of the Brain.*

387. The causes of the attack of congestion or hæmorrhagy within the head, are predisposing and exciting: the former are plethora, repletion, or, on the contrary, exhaustion, inanition, or de-

bility; disease of the heart, especially hypertrophy, and contracted valves, of the left side; some forms of acute anasarca; deranged or suppressed function of the kidney; disease of the arteries or veins, or other tissues within the cranium; &c. The exciting causes are excess in eating; muscular efforts, especially straining, vomiting, sneezing, passion; the recumbent posture, &c.

388. As inflammation usually assumes an *acute* character, congestion and hæmorrhagy are, as generally, *sudden* in their attack. There are frequently, however, certain *antecedent* symptoms, which denote the *threatening* of this attack, and which I shall take great pains to point out to you.

389. I would observe, too, that these antecedent symptoms can only be observed and learnt, —like those of many other diseases,—in *private* practice,—I had almost said, in the cases of the rich and affluent; by which I mean that it is in *such* cases that we are compelled, from our very office, to remain by the patient, watching, anxiously watching, every shade of change.

390. These antecedent symptoms consist of headache, vertigo; a sense of pressure, a sense of confusion; incoherence, delirium; loss of consciousness, of memory; drowsiness; numbness, paralysis, spasm; giddiness, flashes of light, visual spectra, noises; pallor, sickness, vomiting; faintishness; &c.

391. These symptoms are all *cerebral*, with the exception of the vomiting and of the spasms

The relation of the former of these to affection of the head, has been already pointed out; but it cannot be insisted on too much. A fall on the head, inflammation, and other diseases of the encephalon, so frequently induce vomiting, as to make it a most valuable premonitory symptom in these cases.

392. The *attack* of congestion, or of hæmorrhagy itself, is frequently of the most sudden kind. There are total loss of sense and motion; the patient is flushed, comatose, breathes with stertor, and the pulse is strong and full. This is probably the case of congestion. In the attack of considerable hæmorrhagy, there are the symptoms of *shock* inflicted upon the nervous system: pain of the head is followed by paleness, sickness and vomiting, and fainting; coma, or paralysis, loss of speech, or of the power of swallowing, succeed immediately or more slowly, probably according to the promptitude or the extent of the hæmorrhagy. In the attack of partial hæmorrhagy, these symptoms are observed in a slighter form; and it is some paralysis, hemiplegia, partial loss of speech, &c. which ensues. In one interesting case, such an attack as I have last described was followed in a few months by one of severer form, and the patient survived but a few days.

393. It will be perceived that in these cases the true spinal system is affected in proportion to their gravity. To the loss of sense and voluntary motion are now added, dysphagia, stertor,

and relaxed sphincters; sometimes there are convulsions, sometimes contraction of the limbs; in other cases, as I have stated, sickness and vomiting.

394. The ganglionic system suffers in its turn: the bronchia and trachea become clogged with mucus.

395. The injection of inflammation is probably seated in the minute arteries and the capillaries, whilst the morbid anatomy, in these cases, consists in congestion or rupture of the minute veins and capillaries of the membranous substance of the brain. M. Serres speaks of a meningeal apoplexy; M. Cruveilhier depicts an "apoplexie capillaire" of the substance of the brain.

396. The meningeal rupture is both described and depicted by the late Dr. Cheyne,* and by M. Serres.†

397. The congestion of the substance of the brain is readily understood. It is not always obvious on post-mortem examination.

398. Rupture may occur in any part, and even in different parts of the brain, at once, or consecutively, and to any extent. It produces corresponding and proportionate effects,—paralysis, partial or general, and coma, in their various forms and degrees.

399. Diffused meningeal apoplexy; extreme hæmorrhagic effusion into the substance, or into

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* Cases of Apoplexy and Lethargy, 1812, p. 216, pl. III.

† Annuaire des Hôpitaux, 1819, p. 307, pl. XI.

the ventricles of the brain, induce general paralysis, or coma; partial hæmorrhagy of an hemisphere, paralysis of the opposite side of the body; still more partial and circumscribed hæmorrhagy may affect the arm, or the leg only, or the speech. See particularly § 79.

400. The appearance of cerebral hæmorrhagy is very different at different periods after its occurrence. At first there is a mere coagulum of blood of various dimensions and form; afterwards, the colouring matter disappears, and fibrine or serum remains, enclosed in a cyst lined with a fine membrane like the serous membranes; in some cases the sides of this cyst gradually approach each other, and remain in simple contact, or unite. The contents of the cyst sometimes become organized. The parts of the brain surrounding the hæmorrhagy are frequently softened, sometimes as the *cause*, sometimes as the *effect*, of the hæmorrhagy; in old cases they are much indurated. The adjacent arteries are frequently diseased,—beset with calculous or osseous matter,—or affected with aneurism.*

401. The treatment of congestion and hæmorrhagy of the encephalon embraces the use of blood-letting, general and local, purgative medicines, the most rigid abstinence, &c.

402. The principal point which I wish to impress upon your minds in reference to blood-let-

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* See Blane, Trans. of Soc. for the Imp. of Med. Knowl. vol. ii, p. 193; Serres, Archives de Méd. t. x, p. 419; &c.

ting, is its different measure proper in mere congestion and actual rupture. In the former there is extreme tolerance of loss of blood; in the latter, the system is extremely, and even dangerously, susceptible of this loss. The diagnosis is frequently difficult. I have pointed out the most distinctive symptoms, § 392. In addition to an attention to these, I must impress upon your minds the importance of placing your patient in the perfectly upright posture before the blood is allowed to flow: watch his countenance, his breathing; keep your finger on his pulse; and the moment the slightest indication of approaching syncope takes place, arrest the flow of blood and place your patient recumbent.

403. If early syncope occur, trust the future to local depletion by means of cupping to the occiput and the neck. If the patient lose a large quantity of blood without change, pursue and repeat the remedy boldly; his life depends upon ample depletion of the sanguiferous system. Add, to the energetic use of the lancet, that of the cupping instrument.

404. The head should be covered with a spirit lotion. The feet should fomented, involved in ample bran poultices and sinapisms alternately.

405. The bowels must be purged freely, daily.

406. The diet must be mere barley-water.

407. The countenance, the respiration, the pulse, must, however, be watched, and the least disposition to debility cautiously noticed and re-

medied,—even by stimulants, and especially by the carbonas ammoniæ.

408. The next questions relate to the treatment of the paralysis, should the patient survive, or escape, the attack of apoplexy. I must suppose all inflammatory action dissipated. In this case liniments and electricity may be tried, but especially voluntary movements of the limb. Is strychnine ever of advantage?

409. Should not we rather be still contemplating the condition of the brain, and using the remedies proper for this cerebral disease, the source of the paralysis? Cupping, so as to induce irritation, rather than to withdraw blood, setons, issues, near the part affected,—that is, upon the hemisphere opposite to the paralyzed side,—are our principal remedies, but especially the first of these.

III.—TUBERCLES OF THE ENCEPHALON.

410. Besides the diseases which I have hitherto mentioned, there are others which may occur in the encephalon. These are Tubercles and various kinds of Tumors.

411. As inflammation, congestion, and rupture, constitute the acute and sudden affections of the brain; tubercles and tumors present us with slow and gradually progressive diseases of this organ. Not that this rule is without exception: for inflammation is sometimes slow and insidious in its

accession; whilst tumors occasionally produce the sudden attack of an apoplexy.

412. The difference between the same encroachment upon the cavity or contents of the cranium, formed promptly, or with extreme slowness, is enormous. Large tumors, slowly formed, may exist within the skull almost without a symptom; a clot of blood of the size of a pea, or certainly of a nut, in the substance of the brain, may produce hemiplegia!

413. In speaking of tubercles of the brain, I must allude to the important law discovered by M. Louis, in regard to tubercles:—that, beyond the age of fifteen, tubercles are never found in *any organ* of the body without being present in the *lungs?* In a doubtful case, then, we examine the condition of the thorax: if there be tubercles there, it is a presumption that there may be tubercles in the encephalon; if there be no sign of pulmonary tubercle, it is a presumption that the affection of the brain is not tuberculous. But as pulmonary tubercles are not always easily detectible, we endeavour to ascertain, in the absence of signs, whether there be other reasons for supecting tuberculous formation,—such as an hereditary strumous or tuberculous disposition, the general or local signs of tuberculous affection in the system, or in any organ, &c.

414. Otherwise the symptoms of tuberculous affection of the brain are not different from those of slow inflammation.

415. Tubercles occur principally in the cortical and medullary substance of the upper part of the hemispheres; but also in the cerebellum, tuber annulare, medulla oblongata and spinalis; and in the peduncles, the corpora striata, and the thalami. They vary from the size of a millet seed to that of a pea or of an egg. They sometimes become encysted, especially as softening takes place. They frequently excite increased and inflammatory action in the adjacent portions of the nervous mass, whence the symptoms.

IV.—TUMORS OF THE ENCEPHALON.

416. Tumors, and especially the scirrhous and encephaloid, may exist within the cranium. They have occasionally followed blows on the head; they frequently co-exist with other similar affections in other organs of the body.

417. Developed slowly, they may exist with scarcely any symptom, or they may induce symptoms, on the principle, 1, of compression; 2, of irritation; and 3, of inflammatory action in the adjacent parts, of the brain, nerves, membranes, and the cranium itself. These symptoms are frequently induced gradually, sometimes suddenly; and are varied with the part principally affected. They consist of pain, followed perhaps by stupor; loss of smell, sight, touch, hearing, or taste; paralysis; or various convulsive affections as strabismus, or even *epilepsy*.

V.—HYPERTROPHY OF THE BRAIN.

418. This disease has only been recently distinguished from other diseases of the encephalon. We owe our knowledge of it principally to MM. Bouillaud,[*] Dance,[†] Scoutetten,[‡] and Andral.[§] It has sometimes occurred in children; but most frequently between the ages of twenty and thirty.

419. The brain is at once larger and paler than natural. In this latter particular it differs from inflammation or congestion, in which there is also a degree of tumefaction. On opening the cranium, the dura mater seems ready to burst; on removing this membrane, the convolutions of the brain are so firmly pressed together that the intervening triangular spaces have disappeared.

420. The symptoms are those induced by compression: after long-continued pain, loss of intelligence and muscular power; convulsions; epi-

421. In one case only were these symptoms

lepsy.

absent. It was the case of M. Scoutetten, which occurred in a little child aged five, in whom the cranium grew, pari passu, with the augmented size of the brain. This fact has been already noticed, § 112.

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[*] Traité de l'Encéphalite.

[†] Repertoire d'Anatomie Pathologique, 1828.

[‡] Archives Générales de Médecine, t. i. et t. ii.

[§] Clinique Médicale, t. v, p. 595.

VI.—ATROPHY OF THE BRAIN.

422. I have already alluded to the congenital atrophy of the brain, § 129. In this place I simply notice a fact which should not be unknown to you, that the brain sometimes becomes atrophied in some part, especially of the convolutions, in the later, or latest, periods of life. Dementia and paralysis are the effects of this singular malady. Frequently the patient becomes utterly helpless, and passes into *second childhood*, as it is termed, the evacuations passing involuntarily.

423. Sometimes the convolutions are simply reduced in volume; at other times they are puckered; in other cases there is induration.

424. The patient lives a life of a mere excito-motory and nutritive kind. The cerebral functions are obliterated. The true spinal and ganglionic functions remain alone.

435. There is much for the physiologist and pathologist to investigate in this singular *return* to a sort of infantile existence.

VII. OF MANIA.

426. There is still much obscurity in our views of this sad, but interesting subject.

427. The most important consideration in regard to the *causes* of mania, is undoubtedly herditary predisposition.

428. The most powerful of exciting causes is

mental harass: the arduous duties of our prime ministers, the anxieties of the stock-exchange, have frequently led to mania in its worst forms. Another set of causes of mania are the circumstances involved in the parturient and puerperal states, whether these be shock of the system, intestinal irritation, the loss of blood, the establishment of lactation, the condition of the uterine system, &c. I have had the most unequivocal evidence of the influence of loss of blood in inducing mania under other circumstances. For a case of this kind I may refer to the Medical Gazette, vol. ix, p. 421. Protracted lactation is also an undoubted cause of mania. A very morbid condition of the bowels also, indubitably leads to mental derangement: hence the term melancholia.

429. Mania, when it does occur, assumes various forms: it is sometimes attended by an expression of the eye and of the countenance, a manner, a demeanour, a loquacity, which denote the utmost excitement; in other cases it is moping melancholy, with a corresponding attitude and taciturnity; in a third instance there is a monomaniacal disposition to suicide or homicide; in a fourth patient we may have nymphomania.

430. The first symptom is frequently wakefulness. Never neglect this symptom; it is so frequently the prelude to inflammatory or maniacal affections, that it should always be treated with extreme attention.

431. Then some incoherent idea is expressed; love is changed into hatred; friends are viewed as enemies; prosperity as ruin; there are suspicions of a thousand kinds; despondency, or absolute despair; &c.

432. Some such expression will excite your attention to the impending evil, and then you will proceed to ascertain its particular cause or causes, its form, &c.

433. An important question is that which relates to the morbid anatomy: is this *cause* or *effect* of the mania? That it is frequently the effect, and that it has been too exclusively regarded as the cause, I can scarcely doubt. The appearances are usually deposits of serum and of lymph between the arachnoid and pia mater; sometimes effusion into the ventricles, sometimes injection of the cortical substance.

434. In protracted cases these effects may be more considerable still, and lead to dementia, general paralysis, &c. You may consult M. Calmeil's interesting volume upon this subject.

435. If encephalitis is the frequent effect of mental harass and effort, why may not these appearances be the effect of the maniacal state?

436. This question is an important one. If the view at which I venture to hint,—if mania be the *cause* of the morbid appearances,---our hopes are excited; if it be the *effect*, our fears are confirmed. Indeed, I have always observed that certain facts, such as the inveteracy of the case,

a peculiar effect on the countenance, the manner, &c. lead to the formation of an unfavourable prognosis; and, I believe, because they denote the *supervention* of morbid changes in the encephalon.

437. Why is the *moral* treatment so important? It is surely because it diminishes the violence of the maniacal condition, and so obviates its tendency to produce such morbid changes of structure, with its consequent hopelessness.

438. Why is it so important to procure quiet, composed sleep? Obviously for the same reason. Sleeplessness, like mental effort, and the maniacal paroxysm, may induce morbid actions in the encephalon, and these may lead to morbid changes.

439. The evidence from the morbid anatomy is quite deficient for practical purposes, unless we are enabled thus to distinguish cause and effect; and I fear this point has not been sufficiently considered by those who have addicted themselves to this department of medical science. It is sad to observe how a little effusion, a slight layer of lymph, is the *cause* of every thing, in the minds of some of these gentlemen of one idea.

LECTURE VIII.

CEREBRAL DISEASES RESULTING FROM VARIOUS AFFECTIONS OF THE SYSTEM.

440. I NOW wish to draw your attention to a series of morbid affections which result from peculiar affections of the general system, or of various organs. They have been too much neglected by writers on Diseases of the Encephalon. These are—

I. *Intestinal Irritation.*
II. *Exhaustion from Loss of Blood.*
III. *Chlorosis.*
IV. *Excessive Study; Shock; Alcohol &c.*
    I. *Delirium Tremens.*
    II. *Delirium Traumaticum.*
V. *Affections of the Kidney;*
    I. *Dropsy.*
    II. *Ischuria.*

441. Several of these affections are not seen in hospitals; it is in private practice only that we

become acquainted with them. They are also almost neglected by writers on diseases of the brain. Yet it is impossible that you should be prepared for practice without a due knowledge of these diseases.

I.—INTESTINAL IRRITATION.

442. The first of these affections consists of the irritation of indigestible food,* scybala, or other morbid contents of the stomach or bowels, excited into activity by some shock of the system or of the nervous system, such as a fall or other accident; parturition; &c.

443. The symptoms are, rigor, frequently severe heat of surface, and violent pain of the head, and intolerance of light and of sound; the symptoms, in a word, of the most acute encephalitis!

444. The breath is tainted, the tongue loaded and swollen, the secretions morbid; but it would still be difficult to establish a distinct and confident diagnosis without the criterion afforded by the effect of blood-letting in the erect posture, of which I shall speak presently.

445. The first step to be taken, in a doubtful case, is very slowly to administer an enema of from three to three and a half pints of warm water,—and to examine the state of the fæces, and

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* See a paper by the late Dr. J. Clarke, in the Trans. of the College of Physicians, vol. v, p. 109.

observe the effect upon the disease and upon the system. If there be scybala; if the symptoms be subdued; and especially if there be faintishness; the case is indubitably, not cerebral inflammation, but intestinal irritation.

446. If the case still remain doubtful, prepare the arm, open a vein, and then place the patient upright, and let the blood flow until the lips become pallid: if the case be encephalitis, an extreme quantity of blood will flow, even thirty or forty ounces, or more, before there is any appearance of syncope; if it be intestinal irritation, syncope occurs before one-fourth that quantity of blood has left the circulating system!

447. I have insisted so much upon the importance of a knowledge of this disease, and upon the nature of this diagnostic and guard against the undue and inefficient blood-letting, in several works,* that I shall merely refer you to them for further information, which it would occupy me too long to repeat on this occasion.

448. This affection sometimes assumes a far less acute form. I met with such a case very recently. It had been mistaken for encephalitis. The patient slowly but perfectly recovered from attacks of vertigo, &c. by maintaining a regular state of the bowels, diet, rest, and afterwards of gentle exercises, change of air, &c.

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* Commentaries on the Diseases of Females; Researches on Blood-letting, &c.

II.—EXHAUSTION FROM LOSS OF BLOOD.

449. I must refer you to the same works for information on this important subject.

450. Throbbing; pain of some part of the head; a sense of pressure, as of an iron nail, of an iron hoop; intolerance of sound, of disturbance; sleeplessness; a state bordering on delirium; actual delirium, or even mania; some convulsive affection, perhaps epilepsy itself; are the affections which most frequently result from loss of blood.

451. In other cases there are amaurosis; deafness; paralysis; a state of dozing; or slight coma,—the apoplexia ab inanitione.

452. There are some observations upon this subject in a recent volume of the Medico-Chirurgical Transactions,* by Sir B. Brodie: some time after an injury of the head, it became doubtful whether the symptoms depended upon the original accident or upon the treatment. The plan was changed and the patient recovered. In the Medical Gazette† there is an interesting case of *amaurosis* from loss of blood, by Professor Badham of Glasgow, occurring in his own daughter. I believe there was much obscurity in the case until the Professor was shown my work upon the effects of loss of blood.

453. I have known such cases treated upon

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* Vol. xiv, p. 382.

† Vol. xvi, 1835, p. 582.

antiphlogistic principles until there was the most imminent danger, when a change of plan has immediately induced a favourable change, and eventually restored the patient!

454. Gentle stimulants, such as small quantities of brandy, the carbonate of ammonia; chalybeates; and a mild animal diet, are the principal remedies in such cases.

455. I will conclude these brief remarks by observing that the first series of symptoms are entirely cerebral; those observed late in the disease conjoin with cerebral symptoms, symptoms which belong to the true spinal system; the half-closed eye-lid, a degree of stertor, an uncertain state of the sphincters, convulsion, are of this character. Eventually, in the very last stage, the ganglionic system suffers: mucus accumulates in the bronchia, and serum in the air-cells and cellular substance of the lungs; and flatus distends the intestines.

456. After death, effusion is found to have taken place under the arachnoid at the surface and base of the brain, and into the ventricles; there is œdema of the lungs, the intestine, &c.

III.—ON CHLOROSIS.

457. The influence of the state of bloodlessness which occurs in chlorosis, upon the encephalon, has not been duly noticed by practical writers; I shall therefore mention this subject a little more in detail than some others.

458. I have, within the last eight years, seen four cases of fatal chlorosis. The fatal event took place in one case suddenly: the patient was seized, quite unexpectedly, with the symptoms of dissolution whilst sitting up for a few minutes in a chair, when in a state of apparent convalescence from a feverish cold, and speedily expired. In the second case, a feverish cold led to the symptoms of a more gradual sinking. In the third, fever, cough, and aphthæ, followed parturition, and issued in the sinking state. The fourth and last case issued, in the most insidious manner, in a series of symptoms of an equally insidious sinking of the vital powers.

459. Of the second and third cases no post mortem examination could be obtained. In reference to the first and last, and especially the last, I was more successful in my entreaties to obtain this satisfactory elucidation of the nature of disease.

460. Miss H * * *, aged eighteen, was well, with the exception of a little constipation, when she went to school at Boulogne in 1828, aged thirteen.

461. She remained a year, and returned home. She went again in six weeks, and remained another year; and, during this year, the catamenia did not appear, and the bowels were constipated. On her return she looked pale, but she was stout, and grown, lively, and in good spirits.

462. A fortnight after her return, the catame-

nia appeared, but they were pale and scanty: the bowels were constipated.

463. She continued pretty well until July 1833, when she became sallow, pale, affected with pain of the head, and shortness of breath, and coldness and dampness about her person; the catamenia gradually diminished in quantity and colour; the bowels were constipated, and she became fond of concealing and eating dry rice, coffee, and tea leaves.

464. About a year ago the paleness was augmented, and the ankles began to swell; leeches were applied to the temples.

465. During the last summer the paleness augmented still further, and the œdema assumed the character of anasarca; the perspiration became offensive; the catamenia were scanty, pale, and yellowish, or greenish, and varying much in colour, but never red.

466. December 13, 1834.—I saw Miss H * * * seven days ago: the countenance was pale and slightly œdematous; the legs anasarcous; the head affected with mild delirium, with a degree of intolerance of light and noise; the breathing was hurried, and rather audible and rattling, with cough; the pulse 130 and throbbing; the abdomen tumid.

467. These symptoms continued; at first there was delirium; afterwards there were dozing and slight coma; afterwards the mind was clear; at length the coma returned: the respiration became momentarily suspended and the inspiration sudden,

and sometimes *catching*; the abdomen become decidedly tympanitic, with the escape of much flatus; the pulse continued at 130 and sometimes 140, with fulness and throbbing.

468. The strength gradually declined, and dissolution took place rather suddenly after the free evacuation of the bowels.

469. On examination, there was effusion of serum and of opaque lymph under the arachnoid at the summit and base of the brain: there was an effusion of six drams of serum into each ventricle.

470. The summit of each lung was extremely pale, œdematous, and crepitant between the fingers; large portions of foaming lymph exuded from incisions made into them; the root of each lung was red, not crepitant, and sank in water; and, on making incisions, much fluid exuded without *foam* or bubbles of air. The bronchia were injected. Each cavity of the thorax contained five or six ounces of serum, and the pericardium one ounce; the heart was natural.

471. The viscera of the abdomen, except the ovaria, were natural, but pale: there was no effusion; the tympanitis had disappeared. The ovaria were large, and one of them contained a cyst replete with serum, of the size of a large walnut.

472. There was considerable adipose substance.

473. This case is important in every point of

view. It is important in regard to the nature of the disease, of which it is an example, demonstrating, as it does, the tendency of that disease to induce, not merely external dropsy, but effusion under the arachnoid and into the pleuræ, the pulmonary cellular membrane, &c. It is important too, as an unequivocal representation of the disposition to such organic changes in cases of bloodlessness and exhaustion. It is also important as establishing the fact that, not only serous effusion, but the deposit of coagulable lymph may place, without inflammatory action, in similar circumstances; and that, consequently, such deposit of lymph is no proof of inflammation.

474. In a recent fatal case of delirium tremens, serum was found effused under the arachnoid and into the ventricles, whilst opaque lymph was deposited under that membrane. Similar appearances observed in chlorosis enable us to say that such an appearance cannot be adduced in proof of inflammatory action. For no one can imagine that the appearances which have been detailed, as observed in chlorosis, can be any other than the peculiar effects of this disease; or that the deposit of lymph under the arachnoid can depend upon any cause different from that which induced the effusion of serum under this membrane, and from the pleura, and the pulmonary and cutaneous cellular membranes.

475. I need scarcely add the remark, that chlorosis must not be viewed as totally free from

danger. When anasarca has supervened to great pallor, there is the fear of effusion into the encephalon, and of a fatal result, which is sometimes of the most insidious, sometimes of the most sudden, kind.

IV.—OF SHOCK, MENTAL AND PHYSICAL.

476. The immediate result of shock on the general system, but especially on the cerebral system, is of the most interesting character.

477, The influence of *mental* shock is frequently a state bordering on delirium or mania. Suicide is a frequent event at such a moment. There are a sense of weight or pain about the head, and sleeplessness. There is great danger of mistaking the symptoms for mere mental affliction. We ought to *treat* it as a serious malady. The timely use of the lancet would have prevented many an act of suicide! But I will illustrate this point by a most interesting case:

478. A. B——, aged forty, became ruined in character and fortune, and, when in the midst of his difficulties, experienced a sense of heaviness and pressure in the head, and passed sleepless nights. After several days he attempted suicide by dividing the muscles and blood-vessels of the arm deeply. He lost a large quantity of blood and became faint. On recovering from this state, he said to his medical friend—"had you bled me a few days ago I should not have done this act; my feelings are altered, and I regard

suicide with abhorrence; had Sir Samuel Romilly been timely bled, he had still been alive!" From this time all the symptoms subsided.

479. To the same *class* of affections, doubtless, belongs the nervous delirium or *delirium traumaticum*, described by Dupuytren as following serious accidents and operations.

480. There are sleeplessness, delirium, jactitation; the eyes are injected, the countenance flushed and animated, the forehead covered with profuse perspiration; the patient is insensible to the pain of his accident or operation. There is no fever, or constipation.

481. This affection is frequent after attempts at suicide.

482. The patient may fall asleep; awake composed and rational; relapse, &c. It is a short mania of five or six days, It is attended by great danger.

483. There are no distinct traces of morbid change on examination. The brain and spinal marrow are found apparently healthy.

484. The remedy recommended by Dupuytren is a small enema with five or six drops of tinctura opii, repeated three or four times, at intervals of six hours.

V.—THE EFFECTS OF ALCOHOL.

485. These cases are obviously allied to *delirium tremens*, the result of drinking liquors. In

this case there are wakefulness, delirium, and tremor, singularly combined.

486. The symptoms of delirium tremens may occur during the habit of taking alcoholic liquors; or immediately after the wonted stimulus is withdrawn.

487. The first system is tremor; this leads to sleeplessness; and this to delirium. The delirium frequently consists in the imagined presence of objects which the patient is anxious to seize or to avoid. The tongue is white; the breath tainted; the surface moist; the pulse becomes frequent.

488. In the advanced stage, the delirium may be replaced by coma, the tremor pass into subsultus tendinum, the evacuations become involuntary.

489. The attack of delirium tremens is very apt to recur. The first attack is rarely fatal; but a subsequent attack may terminate unfavourably.

490. The morbid appearances observed,—usually after second attacks,—are the effusion of serum into the ventricles, and of serum, and even of lymph, under the arachnoid.

491. I have known free blood-letting induce a degree of sinking, both in young and old, from which no means could restore the patient. Opium, with a strict attention to the diet, and the secretions, constitutes the most efficacious remedy. It becomes a serious question whether any stimuli should be allowed.

492. There is an interesting fact in the Précis d'Anatomie Pathologique of M. Andral, t. ii, p. 770, illustrative of this latter question. A drunkard is cast into prison and put upon prison diet: becomes affected with delirium; is allowed a certain portion of spirit and water; and immediately recovers.

493. The three affections which I have thus briefly brought under your notice, highly merit your best attention. I now pass on to two others, of a very different character. The first of these is a cerebral affection, which is apt to occur in the course of some

VI.—DROPSIES.

494. Dr. Wells, of St. Thomas's Hospital, was amongst the first to draw the attention of the profession to the frequent presence of albumen in the urine of patients affected with dropsies, preceded or unpreceded by scarlatina, in two most admirable papers published in the Transactions of a Society for promoting Medical and Surgical Knowledge; v. iii, p. 167 and p. 194. Dr. Wells's observations have been amply confirmed by Dr. Blackall, Dr. Bright, &c.

495. In the midst of such a disease, the patient is not unfrequently attacked with symptoms denoting a cerebral or true spinal affection. There are delirium or coma; or convulsions;—apoplexy or meningitis.

496. I have already more than once alluded to such an affection in children: § 384. Dr. Wells mentions this affection, p. 177; Dr. Bright gives such a case in his Medical Reports, v. i, p. 97; there was, in this last case, "a slight serous effusion under the arachnoid." The subject is in need of renewed investigation.

VII.—ISCHURIA.

497. The next disease to which I must refer you as intimately connected with the brain, is ischuria, or suppression of the urine, to which may be added other morbid conditions of this secretion, besides that marked by the presence of albumen. Dr. Prout,* Dr. Abercrombie,† and Dr. Wilson,‡ have lately treated this subject.

498. There is frequently considerable disease of the kidneys. The suppression may be partial or complete. It leads to fever; thirst; a urinous taste in the mouth, and smell of the perspiration; nausea, vomiting, hiccup; delirium, coma, convulsions.

499. It was necessary that I should enter into these brief details. Otherwise the sketch of my subject would have been incomplete. When the whole outline is filled up, I flatter myself that it will present a work of great *practical* as well as scientific interest; and I trust that I shall be

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* On the Urinary Organs; ed. 2, p. 303.

† The Edinb. Med. and Surg. Journ. v. xvii, 1821, p. 210.

‡ The Medical Gazette, v. xi, 1833, p. 777.

enabled to accomplish this before many years have passed away. I now proceed to give you some account of the morbid affections of the cerebral nerves.

LECTURE IX.

ON THE DISEASES OF THE CEREBRAL NERVES.

500. In treating of the diseases of the Cerebral Nerves, I must beg you to refer to the arrangement of these nerves formerly laid before you, and especially to remember that they are divided into *sentient* and *voluntary*. See § 15.

I.—ON PARALYSIS.

1. *Of the Sentient Nerves.*

501. In an interesting case of a tumor, found at the anterior part of the base of the brain, the *olfactory* and *optic* nerves were destroyed, and with them the sense of smell and of vision.

502. The *optic* nerve may be subjected to compression or disease in any part of its course, from its origin to its termination in the retina itself. In one case, a partial loss of vision coincided with strabismus, the defective eye being drawn in-

wards. In another, there were, at the same time, defective vision and spasmodic affection of the *seventh* of the same side.

503. Amaurosis may occur in the affections of the brain. It is frequent in hydrocephalus; rare in paralysis. It occurs, as I have already stated, § 452, from extreme loss of blood.

504. I have already adverted to the difference between the case of paralysis of sensation of the face in hemiplegia, or from division of the *fifth* in a part of its course *exterior* to the cranium, and that arising from division or disorganization of this nerve *within* the cranium; § 68, 73. In the first two cases the eye is unaffected; in the last, this organ gradually perishes,—as I imagine, from the destruction of its ganglionic or nutritive nerve.

505. This extraordinary fact was first ascertained by M. Magendie,* in experiments; it was then observed in the human subject by M. Serres.† It has since been witnessed by Dr. Alison,‡ Mr. Stanley,§ and other observers.

506. In M. Serres' case, the right eye and the right nostril were insensible; the left sensible; the gums scorbutic. On examination, the origin of the *fifth* pair of nerves, on the right side of the tuber annulare, was found diseased.

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* Journal de Physiologie, t. iv, p. 176.

† Anatomie du Cerveau, t. ii, p, 67.

‡ Abercrombie on Diseases of the Brain, ed. 3, p. 424.

§ Ibid, p. 425.

507. Dr. Abercrombie observes—"A remarkable circumstance connected with the affections of the fifth nerve, is the tendency to inflammation and sloughing in parts which have lost their sensibility,—particularly in the eye. A very instructive case of this kind occurred to my friend Dr. Alison. The patient had loss of common sensation of the left side of the face, the left nostril, and the left side of the tongue, with insensibility of the ball of the eye, and occasional bloody discharge from the left nostril; and was liable to attacks of pain, occasionally accompanied with fever, during which the pain was chiefly referred to the insensible parts. There were frequent attacks of inflammation of the left eye, with dimness of the cornea, which were relieved from time to time by the usual antiphlogistic means; but at the end of two months, a line formed round the base of the cornea, which at length sloughed out, and the contents of the eye were entirely discharged. The muscles of the left side of the jaw were paralytic, and felt quite flaccid when the patient chewed or clenched the jaws; but the motion of the muscles of the cheek was unimpaired. After the destruction of the eye, the paralytic symptoms remained stationary for a year or more; there was then a violent return of headach, with fever, and death in a state of coma after an illness of a fortnight. On inspection, there was found considerable ramollissement of some of the central parts of the brain. The fifth nerve of the left side, on being traced backwards from the

ganglion, was found, close to the ganglion, to be of a very dense texture, but beyond this it was much wasted, and at its junction with the tuber annular, nothing but the membrane seemed to remain. In another case of Dr. Alison's, there was loss of sensation of the left side of the face, followed by inflammation and sloughing of the eyeball; after which, the sensibility of the parts returned. The patient was, before the appearance of these symptoms, and has since continued, liable to severe headach and epileptic fits. The loss of sensibility continued about six months.

508. "A remarkable combination of symptoms occurred in a case related by Mr. Stanley.* There was hemiplegia of the left side, without loss of sensation in the arm and leg, but in the left side of the face both sensation and motion were entirely lost. In the left side of the tongue, sensation was lost, but motion remained. The mucous membrane of the left nostril was always of a deep red colour, and there were frequent discharges of blood from it. The conjunctiva of the left eye became deeply injected; this was followed by opacity and ulceration of the cornea, and at last by total disorganization of the eye. There was total loss of hearing in the left ear. There were frequent attacks of erysipelas, which were entirely confined to the paralytic parts of the face. The patient had been long affected with headach, and at last died, two months after

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* Med. Gazette, vol. i.

the commencement of the paralytic symptoms. A tumor was found in the left side of the tuber annulare, which compressed the origin of the fifth and seventh nerves against the base of the skull. The tumour was the size of a walnut, of a firm consistence, and brown colour, and extended into the left crus cerebelli."

509. Paralysis of the *fifth* pair, in its exterior course, was first distinctly pointed out by Sig. Bellingeri, in Itally, and afterwards by Sir Charles Bell in this country. The former of these writers has published a case, in his Dissertatio Inauguralis,* 1818, of paralysis, I think, of the *fifth* and of the *seventh* nerves. The precise nature of the case is not, however, certainly known, the patient having happily recovered.

510. The most interesting case of this kind, which it has ever been my lot to witness, was that of Ruth Peters, aged sixty, who was repeatedly seen by my pupils during the last session: this person was taken with pain of the right temple, deafness of the right ear, partial paralysis of motion and of sensation on the right side of the face —the right eye-lid being only slightly depressed on attempting to shut the eyes, and the mouth being drawn to the opposite side. These symptoms continued, and, in three months, precisely similar events occurred on the left side, in a severer form, the mouth being drawn to the right.

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* *See* p. 125; and the Medico-Chirurgical Review for October 1834, p. 415.

511. These phenomena continued for a considerable period. At length *this* portion of the bone fell upon the upper surface of the soft palate, and was eventually dislodged and rejected by the mouth. It proves to be a portion of the sphenoid bone. The appearance of this bone affords an explanation of the interesting series of phenomena observed in this case. There was disease of the base of the brain, which interfered with the functions of the *fifth*, the *seventh*, and the *eighth* pairs of nerves.*

512. I need scarcely observe that the eighth or auditory nerve is liable to pressure or disease within the cranium or within the ear, and that deafness is the consequence. Paralysis of the seventh and of the eighth not unfrequently exist together, as in the case I have just related: this *coincidence* leads us to the conclusion that there is some *internal* disease.

513. I must now draw your attention to the *ninth*, or *glosso-pharyngeal* nerve; see § 15. It has long been disputed whether the sense of taste be situated at the *tip* or at the *root* of the tongue. On this question another depends, viz. whether the nerve of taste be a branch of the *fifth*,—long termed the gustatory, or the *ninth*, or glosso-pharyngeal, the former being distributed upon the tip, the latter upon the root, of that organ. The celebrated Scarpa, in his splendid work on the Nerves†, has detailed some novel and interesting

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* Compare Mayo's Anat. and Phys. Com. No. II, p. 12—15.

† Pages 16—17.

experiments, from which he concludes that the sense of taste is situated at the tip of the tongue. He observes—

514. "It is abundantly proved, not merely by anatomy, but by experiments lately made on the human subject by Alex. Volta, Professor of Physics, that the sense of taste resides in the tip of the tongue, and in its margins, almost to the middle of its length; and that, beyond that part, as far as to the base of the tongue, there is either no sense of taste at all, or to a very feeble degree. He applied a plate of zinc to the tip or margins of the tongue, and a silver spoon to the back of that organ beyond the middle part; the handle of the spoon was then brought into contact with the zinc, when an exceedingly acid taste was immediately perceived in the tip or margin of the tongue, which continued so long as the metals were in contact; but there was no sense of taste in the base of the tongue. It must not, however, be supposed that silver is incapable of communicating tho electric impulse and stimulating the tongue; for, upon inverting the application of the metals, so that the silver be applied to the tip or margins of the tongue, and the zinc to its base beyond ths middle part, when they are brought into contact, an acrid, burning, bitter, alkaline taste is perceived in the tip or margin, but none at all in the base, where the zinc is applied: hence it is evident that the principal and exquisite sense of taste is situated in the tip and anterior margins of the tongue, from its middle portion forwards, but

that the rest of the base and the root possess merely the common sense of touch. By means of this very simple process any one can prove, by his own experience, that the acuteness of the sense of taste is proportionably diminished as the zinc or silver is removed from the tip and margins, towards the back and root of the tongue."

515. Dupuytren deduces the opposite conclusion, from experiments made by himself, with the view of an immediate application to a case of pathology:

516. "Il a fait dissoudre séparément, dans de l'eau, quatre substances de saveur différente, savoir du *sucre*, du *sulfate de quinine*, du *muriate de soude*, et *un acide*. Ces dispositions prises, afin que les expériences fussent concluantes, il les a commencées sur des sujets sains. Des élèves s'y sont soumis; la langue étant tenue immobile, quelques gouttes de ces substances ont été placées sur la pointe: presque aucune saveur n'a été perçue; d'où le professeur a conclue qu'elles agissaient peu sur cette partie: ensuite, la langue étant toujours tenue immobile, les corps sapides ont été placés au milieu at à la base de cet organe; les diverses saveurs ont été parfaitement senties."*

517. *Both* these authors conclude that the *fifth* is the nerve of taste! Dupuytren proves by experiment that the sense of taste resides at the *posterior* part of the tongue; it is well known to him that the *fifth* is disturbed to the *anterior* part

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* Leçons Orales de Clinique Chirurgicale, t. i, p. 407.

of that organ; still he concludes that the fifth is the nerve of taste! So difficult is it to free ourselves from preconceived opinions.

518. These questions have been very recently taken up by Professor Panizza. The interesting paper of that physiologist is given entire in the last number of the Edinburgh Medical and Surgical Journal (vol. xlv, No. for January 1836, p. 70); and to it I must refer you briefly, stating that the conclusions to which its author is led, are—1, that the sense of taste resides towards the base of the tongue, in the filaments of the *ninth* or glosso-pharyngeal; 2, that the sense of touch in the tongue resides near its point, in the filaments of the *fifth;* and 3, that the *twelfth* is the true myoglossal or motor of the tongue.

519. The experiments of Professor Panizza appear to have been made with great care. An animal, in which portions of both glosso-pharyngeals had been removed, would be of constant physiological interest.

520. It will be difficult to confirm or correct these views from experiment by clinical observations. The glosso-pharyngeal is double, and if one part were compressed by a tumor or destroyed by disease, the other would still partially supply the sense of taste to the tongue.

521. There is an interesting case, in point, however, in a note to the translation of Dr. Abercrombie's work, by M. Gendrin; ed. 2, p. 627, which is given in great detail, and which will be read

with great interest. The nerve was atrophied by the pressure of a cyst. "La sensibilité du tact de la langue était conservée dans toute son étendue, la douleur produite par un piqûre d'aiguille était sentie sur toute la surface de sa moitié atrophiée, comme sur celle de l'autre moitié. Le froid et le chaud produisaient aussi la même sensation sur chaque moitié de cet organe. Des substances sapides, de l'hydrochlorate de soude, de l'acide acétique, de l'extrait de coloquinte, furent appliqués successivement sur chaque moitié de la langue; ils n'occasionèrent sur la moitié atrophiée qu'une impression de saveur fort obscure, qui ne se manifesta que sept à huit minutes après leur application: tandis que la sensation produite par l'application de ces corps se fit sentir vivement, au bout d'une minute à une minute et demie, sur la moitié non-atrophiée."*

522. Lastly, the researches of Sir Charles Bell, M. Magendie, M. Muller, and Professor Panizza, have distinctly proved that the *posterior* column of the spinal marrow is formed by the sentient nerves. When this column alone is disorganized, the sense of touch alone is impaired.

II.—*Of the Voluntary Nerves.*

523. Paralysis of the voluntary nerves is marked by loss of voluntary power over the muscles.

524. When the third, or the oculo-motory, is dis-

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* Pages 629—630. Comp. Mayo's Com. No II, p. 14.

eased or compressed, we have various forms of *strabismus*, according as the affection involves more or less of its branches. Some defect of vision is frequently conjoined with it. The strabismus consists in a *defect* or *loss* of movement, which is permanent; and in this it differs from *spasmodic* strabismus, from an affection of another system of nerves.

525. When the *minor* portion of the *fifth*, or the *masticatory* nerve is paralyzed, the temporal, the masseter, and the buccinator muscles lose their voluntary powers, and eventually shrink and become emaciated. I may refer you to § 506, and to a case published by Sir Charles Bell.[*] It exists in the case in which the *fifth* is entirely destroyed or compressed *within* the cranium. The patient loses the power of mastication, and of blowing a trumpet, or of smoking a pipe, on the affected side. There is no *distortion*, as in disease of the *seventh*, or facial nerve.

526. In the list of voluntary nerves, given § 15, *part* of the *seventh* should have been included. When this nerve is entirely paralyzed, the face is extremely distorted, especially in laughing, &c. and the orbicularis has lost its powers.

527. Sir Charles Bell's work[†] is replete with the most spirited descriptions of the paralysis of the *fifth* and of the *seventh* pairs of nerves. But I must refer you to his admirable work itself.

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[*] The Nervous System, 1830, p. cxiv.

[†] The Nervous System.

528. Sig. Bellingeri and Sir Charles Bell have run the same career of discovery in distinguishing paralysis of the *seventh* or facial nerve. The following case is copied from the former writer:—

529. "A patient was lying at St. John's Hospital, under the care of Professor Geri, having been affected for a long time with an inflammatory tumor behind the right ear, which had extended both above and below the mastoid process, so as to compress the facial nerve, at its point of exit from the stylo-mastoid foramen; such was the decided opinion of the Professor, and of Drs. Gallo and Riberi. Meantime the patient presented almost entire paralysis of the muscles of the right side of the face, and distortion of the left side of the mouth. There was, in fact, complete paralysis of the frontal muscle, the supraciliary, the orbicularis palpebrarum, the elevator alæ nasi, and labii superioris, the caninus, zygomaticus, the right side of the orbicularis labiorum, the triangularis and quadratus menti, and colli-cutaneus. The motion of the temporal, masseter, buccinator, and pterygoid muscles, was perfect, or nearly so; of the digastricus we could from no opinion. The motion of the ball of the eye and of the upper eye-lid was free; the vision of the right eye was, however, a little injured; the tongue, also, was moved with some difficulty, yet was the taste proved to be unaffected on either side of the tongue; the sense of touch was also

uninjured in the face; the hearing was considerably impaired in the right ear; the abscess had opened in the external ear. The patient died in about two months. An effusion of pus was found in the cavity of the tympanum, contained in the aqueduct of Fallopius, and compressing the facial nerve in its course; there was no pus or trace of inflammation about the stylo-mastoid foramen after death; but marks of recent inflammation and suppuration in the right lobe of the cerebellum; the fibres and trunk of the fifth pair were uninjured."*

530. I have already noticed, § 74, 75, the *partial* paralysis of the *seventh* in hemiplegia: the voluntary portion is paralyzed; the branch which belongs to the excito-motory system, § 17, is unaffected; the eye-lid is closed by its sphincter, the orbicularis, during sleep. In *total* paralysis of the *seventh* from the pressure of a tumor, for instance, the orbicularis loses its power, and the eye remains exposed and becomes inflamed. The inference from these facts is, that the *seventh* is *more* than a cerebral nerve. Indeed, the function of the orbicularis, in sleep, so similar to that of the other sphincters, leads to the same conclusion. The question still, however, requires elucidation.

531. I now come to the *twelfth* nerve, or the

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* *See* p. 181; and the Med. Chir. Review, for October 1834, p. 419.

myo-glossal. Dupuytren gives a most interesting account of a case supposed to be paralysis of this nerve:—*

532. There were rheumatism of the neck, situated along the vertebræ and occiput; and the gradual loss of muscular power, with atrophy of one half of the tongue, the sense of taste towards the base of the tongue remaining entire. The myo-glossal nerve is supposed to have been involved in the disease at and after its exit from the cranium; hence the affection of the tongue. The scarificator and cupping glasses were repeatedly applied behind the mastoid processes, with satisfactory results.

533. After the myo-glossal, I must briefly allude to paralysis of the *anterior* spinal nerves, or *prolongations* of cerebral voluntary nerves *within* the spine.

534. In the Journal de Physiologie of M. Magendie, t. vi. p. 138, there is a case by M. Velpeau tending to prove the difference of function of the posterior and anterior spinal nerves. M. Velpeau observes, in conclusion—"la distinction sur les fonctions diverses des racines nerveuses, distinction rendue si évidente par les expériences sur les animaux, est encore fort obscure quand on cherche à la juger par les faits pathologiques: néanmoins l'observation renfermée dans cette note est la plus concluante qui ait été remarquée en faveur de cette opinion."

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* Leçons Orales, t. i, p. 403.

535. In every case of spinal affection it will be interesting to determine the degree in which the sentient and motor columns and nerves are involved in the disease.

II.—SPASMS.

536. I have hitherto treated of paralysis of the cerebral sentient and motor nerves; I must now have drawn your attention to certain spasmodic affections of the latter of these, if I had not my doubts whether the *cerebral* nerves, as distinguished from the *true spinal*, were ever affected with spasm. This mere doubt will suggest an inquiry of the deepest interest, both in physiology and pathology.

537. The substance of the brain;* the olfactory nerves; the retina, the optic nerve; the auditory nerve;† the glosso-pharyngeal,‡ are *insensible* when wounded or pinched. Wounds of the cerebrum do not induce spasmodic contraction. No experiment has hitherto been made upon any purely *cerebral* voluntary nerve, with the view of determining whether, in such a case, there would be spasmodic action. Perhaps such a nerve does not exist free from the intermixture of *true spinal* filaments. Is the *third*, or the *oculo-motory*, of this character? These, with many other questions, are still left for future inquiry.

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* Flourens, Recherches sur le Systême Nerveux, p. 17.

† Magendie, Journ. de Physique, t. v, p. 38.

‡ Pannizza, Edinb. Med. and Surg. Journ. vol. xiv, p. 86.

[illegible]

OF DISEASES OF THE CEREBELLUM.

538. I remains for me to make a few remarks upon diseases of the cerebellum, before I pass on to the interesting subject of disease of the spinal or excito-motory system.

539. The experiments of M. Flourens,[*] the experiments and clinical observations of M. Serres,[†] and similar observations of M. Andral,[‡] are the principal sources of our knowledge of this subject.

540. M Flourens considers the cerebellum to be the organ of equilibrium in the movements of the animal frame, judging from experiments of the most interesting character.

541. M. Serres' opinion is that of Dr. Gall, founded upon new experiments and cases,—that the cerebellum, and especially its median lobe, is the excitor of the genital organs. I think neither these experiments nor cases sufficiently isolate the functions of the cerebellum and of the upper part of the spinal marrow. The median lobe of the cerebellum can scarcely be diseased without affecting the medulla oblongata. And the experiments seem also to have involved an injury of that part of the nervous system, as you may judge from the following extract:—

542. " Sur des bœufs abattus en portant des

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[*] Recherches, &c. p. 36.

[†] Anatomie du Cerveau, t. ii, p. 601; Journal de Physiologie, t. ii, pp. 172, 249.

[‡] Clinique Médicale, t, v, p. 558.

coups de marteau sur la partie postérieure de l'occipital, j'ai rencontré le cervelet déchiré dans sa partie supérieure, chez ceux chez lesquels la verge avait offert pendant l'expérience un mouvement d'oscillation très-prononcé.

543. " Sur un cheval entier dont la jambe avait été écrasée par une voiture, un couteau à amputation plongé sur le lobe médian du cervelet, d'avant an arrière, jusqu'au haut de la moëlle épinière, détermina une érection très-prononcée.

544. " Mais ce résultat a surtout été constaté depuis la publication de ces faits, par un de nos habiles physiologistes, M. le professeur Ségalas.

545. " Si sur un cochon-d'inde mâle dont on mis le cerveau à nu, dit ce physiologiste, on plonge un stylet dans le cervelet, de manière á arriver á la partie supérieure de la moëlle de l'épine, on produit l'érection; si l'on pousse ensuite le stylet dans la colonne vertébrale jusques dans la région lombaire, l'éjaculation a lieu, tandis que la vessie, fût-elle pleine, n'en conserve pas moins son dépot. Les mêmes phénomènes s'observent dans les cochons-d'inde décapités, quand on agit de même avec un stylet de haut en bas sur la moëlle de l'épine.

546. " Cette dernière expérience, que j'ai répétée et dont chacun peut s'assurer par soi-même, prouve deux choses; la premiére, que l'irritation du cervelet détermine l'érection; la seconde, que la partie inférieure de la moëlle épinière produit

l'éjaculation, et agit plus spécialement sur les appareils sécréteurs du sperme."*

547. M. Andral observes,†—"Dans les trente-six cas que nous analysons, il n'est question que trois fois de l'appareil génital. Dans un de ces cas, on observa une érection permanente du pénis pendant tout le temps que le malade fut suivi. Il y avait dans un de ces cas une compression exercée à la fois par une masse tuberculeuse et sur le bulbe droit du cervelet, et sur le bulbe rachidien (observation du docteur Sorlin, consignée dans la Thèse de M. Léveillé)."

548. Diseases of the cerebellum, when they induce paralysis, usually affect the *opposite* side of the body, and the inferior more than the superior extremities.

549. Convulsions are more frequent in the diseases of the cerebellum than paralysis. They affect many parts, and resemble epilepsy; or only one part. There can be little doubt that it is the adjacent medulla oblongata which is really irritated so as to produce these phenomena.

550. In some instances there has been a loss of balance, such as occurs in intoxication.

551. Sometimes the sensibility has been affected,—exalted or impaired. In some cases there has been amaurosis.

552. Vomiting sometimes occurs as a prominent symptom, as in many other diseases of the

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* Anatomie du Cerveau, t. ii, pp. 605, 609.

† Op. cit. t. v, p. 735.

encephalon. This, as well as the affections of the genital organs, is obviously a result of irritation of the medulla. M. Andral observes,* with great justice,—"Dans le point où l'on découvre une lésion, ne réside pas toujours la cause directe des effets qu'elle produit, et, suivant qu'elle retentit sur tel ou tel autre point spécialement destiné à l'accomplissement d'un certain acte, c'est ce lui-ciqui se trouvera modifié."

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* Op. cit. t. v, p. 734.

LECTURE X.

THE DISEASES OF THE SPINAL MARROW.

553. It is utterly impossible to understand the diseases of the spinal marrow, without a constant reference to its peculiar functions, as distinguished from those of the encephalon. I refer you to the observations which I made in a previous letter upon this distinction; § 337 and 409.

554. Such disease of the spinal marrow as may materially affect its functions, induces, in the first place, paralysis of the cerebral nerves, sentient and voluntary, which run along its course, forming a part of its structure; and, in the second, either an excited or paralyzed condition of its own peculiar functions. The symptoms combine, therefore, paralysis of sensation and voluntary motion in the parts below the disease, with spasm, and ultimately paralysis, resulting from the affection of the *true* spinal marrow. I have spoken of

the anatomy, and of the physiology, § 8—; 23—; from these you may deduce the symptoms.

555. In treating of the disease of the spinal marrow, I shall pursue the following order. I shall notice—

- I. *The Centric Diseases, or Diseases of the True Spinal Marrow itself.*
- II. *The Eccentric Diseases, or Diseases excited through the Excitor Nerves.*
- III. *The Diseases of the Motor Nerves.*

556. Of these diseases, the first is

INFLAMMATION WITHIN THE SPINE

and this, like Encephalitis, § 356, is to be distinguished into—

- I. *Inflammation of the Membranes, or Spinal Meningitis.*
- II. *Inflammation of the Substance, or Spinal Myelitis;*
  - 1. *Of the Cerebral, or Sentient and Motor Tracts.*
  - 2. *Of the True Medulla; and*
  - 3. *Of its principal Divisions;* § 47.

557. *The causes* of inflammation within the spine are, principally, blows or falls, violent muscular efforts, and exposure to damp or cold. One patient became affected with acute spinal myelitis from being long exposed to the rain and cold in an open boat. This affection has frequently

occured from the pernicious custom of lying upon the damp grass. Rheumatism seems occasionally to have led to this disease. The observations of M. Louis* have distinctly shown the connection between caries of the vertebræ and spinal myelitis.

558. *The symptoms.* It is rare that meningitis of the spine exists without meningitis within the cranium. It is equally rare for the membranes to be inflamed, or one of the cerebral tracts, without affection of the substances, or of the other portions of the spinal marrow. The distinctions between these affections are not, therefore, easily defined. See § 534. Happily, they are not essential to the treatment. Those symptoms which point to such distinctions will be noticed, however, as we proceed.

559. A much more interesting distinction arises from the various locality of the inflammation, according as it affects the medulla oblongata, or the cerebral, dorsal, lumbar, and sacral portions of the spinal marrow; § 17. A knowledge of the anatomy and physiology frequently enables us to define the region of the spinal marrow which is the seat of the disease, and guides us at once in our prognosis, and in the local application of remedies, the most important part of the treatment.

560. In general, the symptoms of meningitis

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* Mémoires sur Diverses Maladies, p. 410.

are *more* those of *irritation* of the spinal marrow, or *spasm;* those of *myelitis*, *more* those of *destruction* of the organ, or paralysis. Both kinds of symptoms may exist, however, or follow each other, in both diseases.

561. Diseases, especially those of the nervous system, are usually more complicated in individual patients, than as they are described in books. Hence a difficulty in the commencement of practice. You are led to expect impossibilities—diseases well defined in their simple forms. It will be well for you, in reference to our present subject especially, to become well acquainted with the anatomy and the physiology, and you will then be able to interpret each symptom justly, as it appears.

562. Amongst the first spmptoms of spinal *meningitis* is local *pain* in some part of the spinal column, augmented by the movements of the patient, and by percussion, but rarely, if ever, by pressure, along the spine. This pain sometimes extends along the back and limbs, in which there is then tenderness on pressure,—a symptom which may serve to distinguish meningitis from myelitis, in which there is usually loss of sensibility.

563. The next important symptom is spasm, or various kinds of muscular contraction. The head, the neck, or the trunk, is bent backwards; or there is trismus, torticollis, partial or complete opisthotonos, or contractions of the limbs,—constant, or recurrent, or exacerbated, in paroxysms,

on moving, or being moved, &c. with extreme pain. Sometimes there are convulsions.

564. The respiration is sometimes difficult. There is sometimes retention of urine and constipation.

565. The symptoms will vary according as the meningitis exists at the base of the brain, at the upper, or at the lower part of the spine, principally.

566. The symptoms of spinal *myelitis* are those of paralysis of sensation and voluntary motion: a sense of numbness, an impaired sensibility; a sense of feebleness, an impaired muscular power; are first observed, singly or combined, in one or both of the inferior, or superior extremities.

567. In some cases, probably of complication with meningitis, there is augmented sensibility. In other cases, there are spasmodic or convulsive affections.

568. If the disease proceeds, the paralysis of sensation and voluntary motion gradually augments. Generally the paralysis affects first the inferior, and afterwards the superior extremities; far more rarely it pursues a contrary course: occasionally the motions alone, and very rarely the sensations alone, are paralyzed. See § 124; 534.

569. If the disease occupy the *upper* parts of the spinal marrow, the respiration, and even the action of the larynx and pharynx, become impaired, and we have difficulty or choaking in swal-

lowing; or asphyxia. There is sometimes the sensation of a cord-like tightness across the epigastrium. If the *lower* part of the spine be affected, the bladder, the rectum, and their sphincters, are variously paralyzed, and there may be retention of urine, and constipation, or involuntary evacuations; or retention and involuntary flow of urine may be combined. The condition of the bladder, and the condition of the rectum should be ascertained by proper examinations, *in every case.*

570. In some instances there is perfect impotence, or inertia of the uterus; in others, the patient has become a father, or the uterus has been excited to expel the fœtus. On these points I refer you to the observations of MM. Chaussier,* Serres,† Brachet,‡ &c. See § 99.

571. These differences, doubtless, admit of explanation by a reference to the *kind* of affection,—irritation, or destruction, and its *locality*,—in the cervical, dorsal, or lumbar portions of the spinal marrow.

572. You will find a valuable case of uncomplicated spinal *meningitis*, considered by M. Cruveilhier as affording a type of that disease, in M. Ollivier's work,§ p. 551. In M. Louis' admirable

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* See Traité de la Moëlle Epinière, par M. Ollivier, ed. 2. p. 791.

† Anatomie du Cerveau, t. ii, p. 609.

‡ Recherches du Systême Nerveux Ganglionaire, p. 246.

§ Traité de la Moëlle Epinière, ed. 2.

"Mémoires" there is an interesting paper on the spinal marrow in caries of the vertebræ, in which you will learn the symptoms and morbid changes in *myelitis;* p. 410; and *especially* pp. 445—447. This work is in the library.

573. *The morbid anatomy* is in every respect similar to that of cerebral meningitis and myelitis, § 373. It is rare indeed, that spinal meningitis occurs without a similar affection of the membranes of the brain. Injection of the pia mater, and of the spinal vessels in general; effusion of serum, lymph, pus and blood, under the arachnoid, —diffused, or in portions; perhaps softening of the adjacent medulla. The arachnoid itself is free from blood-vessels; the morbid changes supposed to take place in this membrane have their seat in the subjacent cellular membrane, or in the pia mater. In *chronic* meningitis there are sometimes membranous adhesions, and effusion of a cartilaginous hardness.

574. The principal morbid change in myelitis is softening, which may occupy the whole, or any portion, either side, or the anterior or posterior part of the spinal marrow; it most frequently affects the cervical or lumbar portions. There is, as in the same affection of the brain, a degree of tumefaction. Induration is the frequent result of *chronic* myelitis.

575. The most efficacious *treatment* of inflammation within the spine, consists, I believe, in

the application of cupping, in acute cases, and of issues and setons in the chronic.

576. Cupping may be applied so as to involve the two principles of local depletion and counter-irritation; for this purpose the scarification should be applied deeply and crossed, and little blood should be drawn; the operation being repeated according to the violence of the disease and the powers of the patient.

577. In reference to the use of issues, M. Louis makes a very apposite remark, p. 447:—"L'expérience a démontré l'utilité du cautère dans la maladie de Pott, quand déjà cette affection est ancienne et le mouvement volontaire plus ou moins profondément altéré. Une conséquence rigoureuse de ce qui précède, c'est que le même moyen doit être employé dans le ramollissement simple ou primitif de la moëlle épinière."

578. The administration of mercury in the acute cases, and in the chronic cases, when these are uncomplicated with a tuberculous diathesis, is an important measure.

579. The most moderate diet should be enjoined, the bowels should be kept free; the recumbent posture, with the utmost quiet, should be preserved. For further suggestions for the treatment, I may refer you to what I have said upon the treatment of encephalitis: see § 376—382.

II.—CONGESTION; HÆMORRHAGY.

580. I believe that little can be said of these forms of spinal disease. If they can ever be suspected during life, it can only be from the suddenness of the accession or attack of the symptoms; and the treatment must be the same as in acute inflammation within the spine.

III.—CENTRIC CONVULSIONS OR EPILEPSY.

581. Any disease within the spine, whether effusion, tumor, exostosis, &c. may induce convulsions or epilepsy.

582. Fright, or other sudden mental emotion, has induced convulsion; and this convulsion has been repeated, affording one of the most deplorable cases of epilepsy.

583. It is well known that profuse hæmorrhagy has led to convulsion. An interesting question presented itself to me upon this point: is the convulsion from hæmorrhagy *cerebral* or *spinal* in its origin? It struck me that this question might be submitted to a decisive experiment.

584. The sheep, when killed by opening the large vessels near the heart, becomes affected with convulsions. What is the effect, if the brain be previously separated from the spinal column? In August, 1835, I went, with my friend Dr. Heming, to submit this question to experiment. The large vessels were first divided in a sheep, and the instrument was then turned so as to entirely separate the head from the trunk, with the

sole exception of the skin. We watched the effects of the flow of the blood: at length the animal became violently convulsed, as in ordinary circumstances of profuse hæmorrhagy. In this case, then, the convulsion from the loss of blood was obviously *spinal.*

585. I have already suggested, indeed, that *all* convulsive diseases are affections of the true spinal marrow. I refer you to the observations made in a preceding lecture: § 89.

586. The cerebrum is obviously the seat of the mind: it is neither sentient itself, nor the originator of motions in itself.*

587. The true spinal marrow, on the contrary, is the term of certain excitements, and the source of certain motions,—the centre, in a word, of a peculiar series of excito-motory phenomena, physiological and pathological. Unlike the cerebrum, it induces, if stimulated, convulsive movements, in the organs appropriated to ingestion and egestion, and in the limbs.

588. Diseases within the cranium, by irritating excitor nerves, or the medulla oblongata, § 112, induce convulsions or epilepsy, too frequently, alas! of an incurable character.

589. Disease within the spinal canal may prove the source of convulsion or epilepsy still more immediately. This form of epilepsy is also, for the most part, incurable.

590. These cases are, for obvious reasons, fre-

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* Flourens, Recherches, &c. p. 17—[illegible]

quently met with in hospitals, asylums, and workhouses.

591. Hence the idea that epilepsy is not to be subdued by medicine, prevalent amongst those who draw their conclusions from observations made in these establishments.

IV.—PARALYSIS AGITANS.

592. I must now draw your attention, very briefly, to another disease of the spinal marrow, —the Paralysis Agitans. Its symptoms have been well described by Mr. Parkinson;* but its morbid anatomy has not been traced. It is usually a disease of advanced life.

593. Paralysis agitans is either—

1. *General; or*
2. *Hemiplegic.*

594. The first symptoms of this *insidious* disease is weakness and tremor, of the head, for instance, of the hand, &c. In about a year, the other hand, or a lower extremity, is affected, or the patient loses his balance in walking. Generally no *cause* can be assigned.

595. There is perpetual tremor, even when the part is supported: the head, the hand, the leg, are moved incessantly; reading and writing become impossible, and the patient cannot guide his hand

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* An Essay on the Shaking Palsy, 1817.

to his mouth; at length he loses his balance, and there is a constant tendency to fall forwards, and, in order avoid this, to run or move with a quicker pace, and on the toes.

596. At a later period the tremor continues during sleep even, augmenting until the patient awakes. There is increased weakness, the trunk is bent forwards, the upright position can no longer be supported. The articulation becomes indistinct, mastication and swallowing imperfect. The bowels are all along torpid, then obstinate; at last the urine and fæces are passed involuntarily. In the last stage of all there is slight delirium or lethargy.

597. The symptoms have, in several particulars, a marked resemblance to the effects observed by M. Serres, of diseases of the *tuber annulare*, and of the *tubercula quadrigemina*.*

598. Of the hemiplegic paralysis agitans, I have long had an interesting case under my care:

599.—— Macleod, aged 28, is affected by weakness and agitation of the right arm and leg, augmented on any occasion of agitation, and on moving: it is observed as he walks, or when he passes his cane from one hand to the other:—there is, besides, a peculiar lateral rocking motion of the eyes, and a degree of stammering and defective articulation.

600. Nearly allied to paralysis agitans is the

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* Anatomie du Cerveau, t. ii, pp. 634, 642. et seq.

V.—TREMOR MERCURIALIS.

601. This disease affects workers in mercury, chiefly those occupied in silvering mirrors.

602. The symptoms are, at first, paralytic tremor and debility, and perhaps ptyalism; afterwards convulsive agitation of the limbs whenever they are moved. The articulation becomes imperfect. The hands are so agitated, that a partly filled cup cannot be conveyed to the mouth* without spilling the liquid. On attempting to walk, the limbs dance and perform irregular movements. Whilst sitting still, the patient may remain free from chorea; but on every exertion of the volition, and on every occasion of mental agitation, the irregular movements are renewed. The sleep is disturbed: the patient awakes alarmed by terrific dreams; there are nervousness and debility; the bowels are constipated.†

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*In a letter writen from Venice by the learned Dr. Walter Pope, on the Miners of Mercury in Friuli, and published in the Philosophical Transactions, vol. i, for 1665, a case is detailed of a patient who "could not with both hands carry a glass half full of wine without spilling it, though he loved it too well to throw it away."

†See further, Bateman s Diseases of London, p 122.

LECTURE XI.

ON THE ECCENTRIC DISEASES OF THE SPINAL MARROW.

I.—ON ECCENTRIC EPILEPSY.

603. I now bring before you one of the most interesting subjects comprised in the class of diseases of the nervous system,—that form of epilepsy which takes its source in the *excitor nerves* of the true spinal system, involving the axis of this system, and its motor nerves, in their turn, functionally, however, not organically. It is for this reason that I have denominated this form of epilepsy, *eccentric.*

604. The eccentric epilepsy is to be viewed as *curable*, however *difficult* of cure. By avoiding the exciting causes, its attacks are avoided, the susceptibility to returns subsides; these returns become less frequent, and less severe, and at length frequently cease altogether. Every thing

depends upon rigid rules proposed by the physician, and strictly and perseveringly observed by the patient.

605. In describing the *causes*, *symptoms*, and *treatment* of eccentric epilepsy, I must recall to your minds all that I have said respecting the anatomy and physiology of the true spinal system. *Every* part of this system is distinctly, but exclusively, involved in the circumstances of this disease: if the encephalon suffer, it is only as an *effect* of the convulsive attacks.

606. The principal causes of eccentric epilepsy are,—1, the presence of indigestible food in the *stomach;* 2, the presence of morbid matters in *intestines;* 3, *uterine* irritation. The first of these acts through the medium of the pneumogastric, the second and third through that of peculiar spinal nerves,—all *excitors* belonging to the true spinal system. Compare what I have already stated on this subject: § 17—; 256.

607. I have so repeatedly known a patient, subject to this form of epilepsy, experience an attack within five minutes of eating some indigestible article of food,—or on experiencing a deranged condition of the bowels,—or on every return of the catamenial period, as to leave no doubt upon my mind upon these important points. I have known the attacks prevented by a steady and cautious attention to rules in reference to these circumstances.

608. In detailing the *symptoms* of epilepsy I

shall have to repeat all that I have said respecting the physiology of the true spinal system: every part, every function, which belongs to that system, is involved in the pathology of epilepsy: the functions of ingestion and of egestion are precisely those affected in this disease; the *causes* act through the *excitor* nerves, the *symptoms* are manifested through the *motor* nerves (p. 15, 16), of that system.

609. The first thing observed is a varied *distortion of the eye-ball*, which is drawn from the axis of vision, generally upwards, and outwards or inwards.

610. The second symptoms are a forcible *closure of the larynx*, and *expiratory efforts*, which suffuse the countenance, and probably congest the brain, with venous blood. In all these circumstances there is a most marked and important difference between epilepsy and hysteria, on which I shall insist hereafter.

611. In the third place, we observe that the tongue is thrust out of the mouth by the genioglossal muscle, whilst the teeth close upon it by the action of the masseters, and it,—or the under lip,—is frequently severely bitten. Or, without the spasmodic protrusion and consequent injury of the tongue, there is grinding of the teeth.

612. We next observe convulsion,—which is general, or of the whole muscular system, or hemiplegic, or confined to one side; or it occurs in the form of trismus, torticollis, in one limb, &c.

613. During these attacks, the *expulsors* of the fæces, the urine, or the semen, sometimes act, and there is the unconscious evacuation of these secretions. There is sometimes regidity of the penis. On this subject I must refer you particularly to § 93—99.

614. You will see, from this brief account of the symptoms, how peculiarly an affection of the true spinal or excito-motory system epilepsy is. The previous arangement of the functions of this system, in your mind, will enable you to remember and to explore the symptoms of this disease, most accurately.

615. I must now draw your attention to another set of *facts* as *causes*, and another set of *symptoms* as *effects*, of the paroxysm.

616. Deep sleep; broken sleep; loss of rest; passion; vexation; exhaustion; inanition; especially rising with an empty stomach, have frequently led to a paroxysm of epilepsy, and must, consequently, be carefully avoided in our rules of regimen for the cure of this disease. I have already alluded to the relation of the σὺνδυσια and epilepsy, § 94.

617. I have known the act of washing the hands in cold water, induce an attack of epilepsy; I have known dashing cold water on the face prevent such an attack. These phenomena must be observed with accuracy.

618. The *effects* of the epileptic paroxysm, to which I have just alluded, are the venons congestion of the brain, and the consequent effusion of

serum in repeated attacks,—effects so carefully to be avoided by the appropriate remedies, on account of the havoc produced by them on the mental faculties and cerebral functions.

619. Our task consists in preventing the attacks of epilepsy, and if this cannot be accomplished, in treating these attacks, and in obviating their effects on the *cerebral* system. We accomplish this task by cautiously avoiding the *causes* by moderating the *paroxysms*, and by local means of subduing vascular action, and perhaps of depleting the vessels of the brain.

620. The strictest rules must be laid down for the diet, for the state of the bowels, for conducting the catamenial periods. These last should be passed in bed, the feet and abdomen should be fomented, the warm water enema, and the opiate enema should be administered.

621. The immediate accession of the paroxysm may sometimes be prevented by dashing cold water on the face, or by exciting the nostrils by snuff, &c. In this manner the disposition to closure of the larynx, and expiratory efforts, is exchanged for sudden acts of inspiration.

522. In the paroxysm, the patient must be prevented from injuring himself by falls or blows. In this danger of injury we have another (§ 610) marked distinction between epilepsy and hysteria.

623. The stupor or coma induced by the paroxysm may require the administration of blood-

letting, general or topical, according to its degree and duration, and probable effects.

624. Besides the means to which I have alluded, other remedies have been proposed for the cure of epilepsy, in an empirical manner, without due attention to the *kind* of the disease. It is obvious that little attention can be paid to propositions and observations so vague and indefinite. These various remedies must be tried anew, after a strict diagnosis. We shall then arrive at an approximation to the truth in reference to the value of these remedies respectively.

625. The views which I have given of eccentric epilepsy are amply confirmed by the facts, that there is no constant morbid change observable in this disease, and that many patients, after long years of its attacks, have finally and fully recovered,—facts which ought to encourage us steadily to pursue the mode of treatment.

626. A system of exercise; regulated sleep; shower bath; tonic remedies, &c. &c. must be added to the other plans.

627. Before I quit the subject of epilepsy, I must make one remark,—upon the similarity of its effects to those of *strangulation.* In *both* these cases there is suspended respiration, with convulsive efforts, congestion of the brain, insensibility; and, to complete the analogy, amongst

the remote *effects* of strangulation, is convulsion itself. I must refer you, however, upon this subject, to an interesting case in Observations on Surgery, by the late Dr. Hey, of Leeds, ed. 3, p. 481.

628. That the convulsions in strangulation are *excited* through the medium of the pneumo-gastric nerves, is rendered almost certain by comparing the effects of the privation of air in animals in which these nerves are left entire, and in others in which they are divided: both die asphyxiated, the former *with*, the other *without*, convulsions.*

629. You will remember what I have said on the subject of *Secondary Asphyxia*, § 178—183. The remedy is, frequent, full inspirations, entirely to remove residuary carbonic acid in the lungs,—repeated until the danger is over.

630. It has been observed, § 257, that convulsive diseases occur in infants, especially during sleep. In this state there is a *defective* respiration, the proportion of carbonic acid in the lungs is greater than in waking hours. May this be an exciting cause of the convulsion? If so, the remedy would be to excite respiration by gently disturbing the sleep after the lapse of a certain time.†

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* See Brachet, du Systême Nerveux Ganglionaire, p. 133.

† The treatment of the effects of opium proceeds upon a similar principle. We keep our patient awake and moving about, and dash cold water in the face, in order to keep up and excite the respiration, and prevent asphyxia.

631. The effects of pinching the pneumo-gastric in a living animal, may be adduced in confirmation of these views. See § 293, 294. The pneumogastric is obviously an *excitor*, as well as a motor and ganglionic nerve.

632. I scarcely dare touch upon the phenomena presented by the generative system during strangulation by suspension: it is well known that those organs are excited, and that there are erection and emission of semen in the male subject, and a uterine flow in the female. It is said that a recourse to a temporary suspension has been had by the sensualist. It is said that, in this manner, an unintentional suicide has been committed.

II.—PUERPERAL CONVULSION.

633. Nearly allied to epilepsy is puerperal convulsion.

634. I have no doubt that the mysterious phenomena of abortion and parturition are phenomena of the true spinal or excito-motory system. The same remark may be made relative to the sickness and vomiting attendant on early pregnancy. To the same class of phenomena, also, belong the convulsions which occur in the *pregnant* and *parturient* states.

635. The principal *causes* of puerperal convulsion, besides the peculiar condition of the uterus

tself, are indigestible food,* a loaded and morbid state of the bowels, a distended condition of the bladder, &c. and mental shock or anxiety.

636. This convulsion itself resembles epilepsy. It is preceded by a peculiar hisping inspiration. It is attended with great danger, the coma induced by it being deep, and the cerebrum obviously much affected.

637. The following extracts from Dr. Denman's work on Midwifery are full of interest, in reference to an exciting cause, and a mode of preventtion of this species of convulsion:—

638. "In a case published twenty-three years ago,—when the os internum began to dilate, I gently assisted during every fit: but being soon convinced that this endeavour brought on, continued, or increased the convulsions, I desisted, and left the work to nature."†

639. "On every principle of removing the cause of the convulsions, of substituting new modes of irritation different from that which produced the convulsions, of preventing their ill effects, or of abating that exquisite irritability which renders patients subject to them, almost every measure and method has at one time or other been tried. *Havrey*‡ recommended the irritation of the nose in a comatose patient who was in labour, and gives an instance of its success. Many years ago I was led

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* See a paper by the late Dr. J. Clarke, on the influence of Oysters; in the Trans. of the Col. of Phys. vol. v, p. 100.

† Ed. 4, 1805, v. ii, p. 372; note.

‡ Exercitat. de Partu., p. 554.

by accident to try the effect of sprinkling or dashing cold water in the face; and in some cases the benefit was beyond expectation or belief: but in other cases, in which I used this method with equal care and assiduity, no good whatever was derived from it.

640. "I subjoin the following case, to explain the manner of using cold water. In a patient in convulsions, who had been bled, and for whom many other means had been fruitlessly used, I determined to try the effect of cold water. I sat down by the bedside with a large basin before me, and a bunch of feathers. She had a writhing of the body, and other indications of pain, evidently occasioned by the action of the *uterus*, before the convulsions; and when those came on, I dashed, with some force, the cold water in her face repeatedly, and prevented the convulsion. The effect was astonishing to the by-standers, and, indeed, to myself. On the return of the indications of pain I renewed the use of the cold water, and with equal success; and proceeded in this manner till the patient was delivered, which she was without any more convulsions, except once, when the water was neglected. The child was born living, about fifteen hours from the time of my being called, and the patient recovered perfectly.

641. "I was much mortified to find, that I had not discovered a certain and safe method of treating convulsions; farther experience convinced me, that this often failed. It is, however, a safe re-

medy; and though it may not always have sufficient efficacy to prevent or check convulsions, whoever tries this manner of using cold water will soon be convinced that it is a most powerful stimulant."[*]

642. *The* remedy is the most efficient bloodletting, and the removal of the causes. Dr. Denman observes[†]:—"The late Dr. Bromfield informed me of a case of puerperal convulsions, for which he had bled the patient without much benefit. In the violence of some of her struggles the orifice opened, and a considerable quantity of blood was lost before the accident was discovered; but the convulsions from that time ceased." Of another patient he observed[‡],—"she fell in labour, she became blind, and had one convulsion. Having great sickness at her stomach, without vomiting, I urged her to irritate her throat with her finger, by which means she vomited five or six times, and had no fit afterwards; the blindness remained in some measure for several days after her delivery. The child had been dead about a fortnight." The bladder, the rectum, should be evacuated.

III.—ON TETANUS.

643. Tetanus has long been divided into the Idiopathic and the Traumatic. I propose to divide it into the *Centric* and the *Eccentric.*

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[*] Exercitat. de Partu, p. 386—388

[†] Ibid, p. 384; note.

[‡] Ibid. p: 380; note.

644. Centric tetanus is that produced by disease within the spinal canal itself; § 559. Eccentric tetanus arises principally from a wounded, lacerated, or punctured, nerve, and possibly from other sources of eccentric nervous and convulsive affection,—as deranged stomach, deranged bowels, worms, &c. It is, therefore, both traumatic and idiopathic.

645. There is a predisposition to tetanic affection in hot climates; sudden changes of temperature, and exposure to cold and damp, are exciting causes. In hot climates infants are subject to tetanus within nine days of their birth, as some have supposed, from the condition of the umbilicus.*

646. The spasms first affect the muscles about the neck; then those which approximate the maxillæ, and there is trismus; then the muscles of the pharynx, and the deglutition becomes difficult. The limbs and the whole frame become stiffened by spasm, which is still further augmented by the slightest touch, jar, or excitement. There is constipation. No one can fail to see that these are affections of the true spinal system. The cerebral system is unaffected. Baron Larrey observes†,—" Les fonctions du cerveau restent intactes jusqu'au dernier moment de la vie, en sorte que l'infortuné atteint de cette maladie se voit mourir."

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* See Cleghorn on the Diseases of Minorca, vol. v, p. 36

† Mémoires de Chirurgie Militaire, t. i, p. 238.

647. One fact is observable. The influence of the lesion of the nerve is not only carried by excitor nerves to the spinal axis, and *reflected* upon motor nerves, but it frequently pursues a *retrograde* course along the spinal marrow: a wound of the foot, not less than a wound of the hand, leads to trismus. A similar event occurs in experiments on the decapitated turtle: if one of the lateral nerves be laid bare and pinched continuously, the muscles of the upper extremities, as well as lower, are forcibly contracted. This s, in my mind, the very *type of tetanus.* The same retrograde action is produced, if in a decapitated frog the spine be divided, and the lower end of the upper portion of the spinal marrow be pinched with the forceps.

648. As in epilepsy, no constant morbid appearances have been found in the cranium or spinal canal.

649. In an interesting case of tetanus, given by Dr. Reid, in the Transactions of the Association of Physicians in Ireland, vol. i, p. 113, great vascularity and an effusion of blood were found round the spinal marrow. In another case, detailed by Mr. Brayne, of Banbury, in the London Medical Repository, vol. xiv, p. 1, two or three inches of the inferior dorsal portion of the spinal marrow were suffused by a continuous blush of inflammation, and three small, hard, white laminæ were seen between the arachnoid and the pia mater. M. Ollivier on the other hand, shows that such

morbid appearances are by no means constant; Dr. Abercrombie and Mr. Gendrin come to a similar conclusion.*

650. The treatment of tetanus is generally unavailing. Considering the *cause* of this malady, and its mode of operation, we should be naturally led to propose the division of the injured nerve, or amputation. There is a sucessful case of the former operation in the Medical Gazette, vol. xi, for 1832-3, p. 623†. In reference to the latter Baron Larrey observes, in his account of the Campaign in Russia‡,—" A l'exception d'un seul, tous ceux qui furent frappés de cette cruelle maladie succombèrent. Ce premier, blessé au pied, du son salut à l'amputation de la jambe, faite dès l'invasion des premiers accidens tétaniques. Les extirpations du bras et les amputations des jambes furent généralement heureuses.' These plans have not succeeded in the hands of other surgeons,—perhaps from being adopted too late.

651. I wish I had space for M. Dupuytren's admirable observations, in his Leçons Orales, t. ii, p. 599—612; they are full of interest; He advises that half-divided nerves should be completely divided. He is opposed to amputation as inefficacious, when tetanus has actually commenced. He adds,—" Du reste, les symptomes et l'autopsie se réunissent pour démontrer que le tétanus est

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* On the Brain and Spinal Cord, 2d French ed. p. 574, 575.

† See also p, 848, and vol. xii, p. 15.

‡ Mémoires de Chirurgie Militaire, t. iv, p. 168.

une affection essentielle, nerveuse et sans lésion organique qui lui soit propre."

652. Blood-letting, opium, the hydrocyanic acid, tobacco, mercury, anatomy; local depletion; purgative medicines, have been tried, with but occasional success. The cold bath has proved immediately fatal.

653. The *principles* of treatment would appear to be,—1, to divide the injured nerve; 2, to subdue the spasmodic affections, by such remedies as the hydrocyanic acid; 3, to prevent organic changes in the nervous system by depletion, general and local; 4, to remove all sources of irritation, as scybala in the bowels, &c.; and 5, to avoid all sources of augmented spasm, such as shocks, noises, &c.

IV.—ON HYDROPHOBIA.

654 Another terrific disease of the nervous system, arising from causes acting at a distance from the nervous centres, is Hydrophobia.

655. A wound inflicted, a poison inserted, probably in the substance of the fine fibrillæ of excitor nerves, is the cause of this disease.

656. After a variable interval, the peculiar symptoms of hydrophobia display themselves. All these symptoms obviously belong to the true spinal or excito-motory functions: they consist in a peculiar spasmodic and terrible *dysphagia* and,

dyspnœa. The parts immediately affected are those which preside over ingestion.

657. The fifth nerve in the face, and in the fauces, and the pneumo-gastric in the larynx, (see § 17, III, 1, 2,) appear to be most unduly impressible. The impression upon these nerves is reflected upon the muscles of the pharynx and larynx, and the sense of dysphagia, or of dyspnœa, is overwhelming. The slightest motion in the atmosphere, the application of a glass or cup to the lips, the sight or idea of water or other fluids, even, are attended by an agony of suffering,—of mingled spasm, choaking, strangulation, and terror.

658. There are, from the first, extreme anxiety of the countenance and inquietude of manner, and a peculiar aggravation of these appearances, at the sight of fluids, or on feeling a gust of air pass over the face, and still more on attempting to drink: by any of these causes, an expression of horror, a sense of suffocation, with constriction about the throat, and convulsive movements, are produced, which are terrible to witness and beyond description. Independently of these causes, there are similar symptoms, only in a minor degree. Later in the disease, the agony of expression and suffering is extreme; viscid saliva forms and collects in the mouth, and is removed with impatience and horror, and spasm about the throat; the mind begins to wander with a terrible delirium; the limbs are moved with continual spasm and agitation.

At length the powers of life and of the disease sink together.

659. M. Gendrin, in a note to his translation of Dr. Abercrombie's work, ed. p. 578, observes,—"J'ai observé plusieurs hydrophobes, et j'ai assisté à l'ouverture des cadavres d'un plus grand nombre encore; il n'y a que quelques mois que j'ai suivi cette horrible maladie, depuis les premiers symptomes jusqu'à sa funeste terminaison; je n'ai jamais vu la moindre trace d'inflammation ou de lésion quelconque dans les organes encéphalo-rachidiens, ni dans les nerfs ganglionaires. La seule lésion que j'ai reconnue est un développement considérable, le plus souvent inflammatoire, des cryptes muqueuses de la base de la langue, du pharynx et de l'orifice supérieur du larynx. Les hydrophobes meurent asphyxiés: on trouve dans leurs cadavres, comme dans ceux des tétaniques, une congestion assez marquée dans les veines pulmonaires, un état général de congestion des principaux viscéres, et particulièrement du cerveau, et le sang liquide d'un rouge obscur dans les vaisseaux."*

660. The treatment of hydrophobia has hitherto been abortive. Every remedy which the terrors of the disease, or the ingenuity of physicians could suggest, has been tried in vain. Dr. A. T. Thomson's case was apparantly mitigated by the hydrocyanic acid. Mr. Mayo has ingeniously suggested the propriety of tracheotomy. If a case

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* Abercrombie, p. 578.

were committed to my charge, I would combine these two modes of treatment. The strychnine might induce tetanus or hydrophobia, but can never cure it, except upon a principle of similia similibus.

V.—HYSTERIA; CHOREA; STAMMERING.

661. These are other affections of the excito-motory system: the first obviously depends upon the state of the intestine or of the uterus; the second, and occasionally the third, upon the condition of the intestine. All have been obviously cured by purgative medicine.*

662. I do not mean to assert that this is the character of every case, especially of chorea and of stammering. There are cases of these affections which are probably of centric origin. We have here again scope for investigation.

663. But I must pass on to notice other subjects. The first of these is the disease termed—

VI.—SPASMODIC ASTHMA.

664. The true spasmodic asthma, as distinguished from other diseases of the organs of respiration, is excited through the excitor pneumo-gastric, or spinal nerves: one patient is seized after eating some indigestible substance; another, on in-

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* See Hamilton on Purgative Medicines; and an interesting case of stammering, cured by this means, in the Med. Chir Trans. v. xvi, p. 72, by Dr. Bostock.

haling certain vapours, and especially the dust of ipecacuanha;* a third, from the presence of morbid matters in the intestines. Many are seized, like the victims of the croup-like convulsions, during the first sleep, and probablyon the same principles: § 609.

665. The pneumo-gastric and spinal nerves convey the impression, which is probably reflected upon the muscular fibres of the bronchia. The rationale is similar to that of the effort observed from the impression made by carbonic acid upon the excitor and motory nerves of the larynx; § 433: the excitor nerves are stimulated, the spinal axis reflects the stimulus through the motor nerves, and the larynx is instantly and forcibly closed, or the bronchia contracted.

666. The phenomena, and the remedies of spasmodic asthma confirm this view: a sudden inspiratory effort, and a continued wheezing expiration, are the most marked symptoms; the removal of the cause or causes, the infusion of coffee, as a beverage, the smoke of the stramonium, are the more immediate remedies.

VII.—ON VOMITING.

667. I must not conclude these lectures without a brief allusion to the act of vomiting. This act

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* It is singular that this substance, taken into the stomach, should excite vomiting, and, inhaled into the bronchia, should excite spasmodic asthma, equally, as it would appear, through the pneumo-gastric nerve.

is always an excited act. It is excited through the naso-palatine branch of the *fifth*, when the focus is irritated; through the *pneumo-gastric* when an emetic is swallowed, or a calculus is passing the *gall-duct*, or the *ureter;* through the *spinal* nerves, when the *intestine* is obstructed, or the *uterus* is excited during the flow of the catamenia, in incipient pregnancy, &c.

668. I must add a few words upon two other subjects, viz.—

VIII.—TENESMUS AND STRANGUARY.

669. I had recently a most interesting case of spasmodic stricture of the sphincters ani. The finger could scarcely be introduced. It was discovered that a calculus existed in the urethra. When this was removed, the stricture immediately ceased.

670. There is no fact so familiar as the retention of urine produced by a ligature applied to hæmorrhoids. The cause and effect are removed together!

671. Tenesmus almost always implies the existence of strangury; and strangury that of tenesmus. They induce each other. They are *similar*, *excito-motory*, phenomena, affecting the exits of two organs.

672. Teething of children has produced both these actions, through a more remote arc of the true spinal system.

673. The last subject which I shall mention under this head is—

IX.—ABORTION

674. I have a number of facts which prove that abortion is frequently an excited act, excited through the spinal nerves of the rectum, and that its prevention depends upon removing and avoiding the causes of this excitement.

LECTURE XII.

ON DISEASES OF THE SPINAL MOTOR NERVES.

675. Spasmodic affections may arise from causes affecting the *excitor* nerves, the *spinal axis*, or the *motor* nerves of the true spinal or excito-motory system: the first and second have been noticed already; § 555 et seq. It now remains for me to treat of the third.

676. In the first place, I must again call your attention to the anatomy, and especially the enumeration of the motor nerves belonging to the true spinal system; p. 25, 26; and to remarks made § 536, 537.

I.—SPASMODIC STRABISMUS.

677. I have already noticed the strabismus which arises from *paralysis* of the cerebral and voluntary nerves, and some of the muscles of the

eye-ball; § 524. I now wish to draw your attention to another form of strabismus, not hitherto distinguished from the former, and which I believe to be an affection of the motory nerves of the true spinal system.

678. In the former case the patient can frequently move the eye-ball fully, in every direction except one; at a certain point the eye-ball stops, although the other eye continues to pursue an object placed and moved before it. This is the case with a patient at this moment under my care for attacks of sickness, with defective vision and motions of the eye.

679. In spasmodic strabismus, the motions of the eye may be perfect, except on certain occasions of excitement, or of disorder, or of intense application or employment of the eye; the strabismus then becomes apparent, the eye-ball obviously is *drawn* in one particular direction.

680. In one interesting little girl, aged about three years, the strabismus came on whenever a stranger came into the room, whenever she was asked to read, &c.

II.—SPASMODIC TIC.

681. The next of these nerves is the *seventh*, or *facial*. So long ago as the year 1817, I published, in the Edinburgh Medical and Surgical Journal,* an interesting case, which is plainly one of spasmodic affection through this nerve:—

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* Vol. xiii, p. 63.

682. "Miss Inman aged ninteen. Two years ago, in the winter season, the face became affected, during the course of one night, in the following manner: all the muscles of the right side of the face were drawn into a state of spasmodic contraction; the sensibility of the skin became much impaired, the contact of an external object inducing a feeling of numbness; there were a degree of swelling, and considerable pain; and a sense of rigidity was felt in the muscles of the right side of the neck.

683. The musculer contraction was permanent, and very considerable: the right angle of the mouth was drawn downwards; the retraction of the integuments, the effect of muscular action, and usually observed extending from each nostri obliquely downwards, is, on the right side, very deeply marked; on the left it is seen in its natural state. The tongue, when protruded, is drawn a little towards the right side; the point of the nose is considerably so. The right eye-brow is drawn a little lower down than the left one; and two small dimples, the effect and evidence of muscular contraction, are seen immediately above it. A dimple in the chin is also distinctly marked, and it is drawn considerably to the right of the mesial plane of the face. Articulation was, at first, very indistinct, and is still so in some degree; the letter *S*, especially, is pronounced with difficulty, and participates in the soft sound of *th.* There is no difficulty in deglutition; but considerable inconvenience occurs during mastica-

tion, from a tendency of the bolus of food to pass and collect in the right side of the mouth. On closing the right eye, a degree of tightness is induced and felt at the right angle of the mouth; this tightness is *seen*, even, when the patient speaks with the right eye perfectly closed. On drawing down the right angle of the mouth, by an effort of the muscles of this part of the face, the upper eye-lid of the right eye is also drawn sensibly downwards, and the eye is partially closed. In the first instancc this eye was closed with difficulty.

684. The state of contraction of the muscles is seen much more distinctly, and the deformity induced is much greater, on speaking or laughing, than when the patient is in a state of tranquillity.

685. At present, the contraction of the muscles is much less than at first. The sensibility is perfectly restored. The diminution of the symptoms took place during the administration of electricity, the operation of blisters, and the exhibition of an emetic, followed by purgative medicines.

686. This affection was considered by the patient as an effect of cold. The swelling and pain were deemed an attack of tooth-ache, but without reason, as there is no decay of any of the teeth. Before and about the period of attack, pains were experienced in both arms and wrist, and were considered rheumatic. During two years previously to the accession of the affection described, this young lady had experienced some general indisposition, having been feeble, nervous,

and subject to difficulty of breathing, and palpitation of the heart. The catamenia had been somewhat irregular. The ankles were affected with œdematous swelling in the evening of each day.

687. This case is deemed particularly interesting, as it establishes a distinct diagnosis between a *spasmodic affection*, and a case, very similar in appearance, consisting of *paralysis* of one side of the face; a distinction which, it is thought, has been sometimes neglected. A further diagnosis, to which the practitioner must attend, consists in the distinction between a primary paralysis of the muscles of one side of the face, occasioned by the agency of internal causes; and a secondary paralytic affection, the consequence of pressure external to the brain."

688. In the Annuaire Medico-Chirurgical des Hopitaux, published in 1819, there is (p. 406) an interesting case of wound of the facial nerve:—

689. "Le 27 février 1814, Charles Leroux, étant au combat de Bar-sur-Aube, fut tiré à quinze pas; il reçut la balle dans le coté gauche du visage.

690. "Ce militaire n'a ressenti qu'une légère douleur au moment du coup. Il n'a éprouvé d'autres accidens qu'un peu de gonflement dans les joues avec une légère altération de la vue, quelques élancemens dans les yeux, et une sensibilité particulière dans l'acte de la mastication. Douze jours après l'accident, les plaies étaient complètement cicatrisées.

691. "Ce qu'il y'a de plus extraordinaire dans cet événement, c'est que, quand cet homme veut parler, rire ou manger, dans tous les cas enfin où il s'agit de mouvoir les mâchoires, il s'opére alors involontairement et comme par sympathie, une contraction des muscles sous-labiaux. Dans le repos des mandibules, les muscles paraissent être dans leur état naturel; le visage n'offre aucune trace d'altération; mais aussitot que cet homme exécute le moindre mouvement des mâchoires, il fait sur-le-champ, sans s'en douter, une grimace effroyable. La figure parait hideuse; elle se décompose, et ce malheureux devient méconnaissable. Cette altération des traits est bien plus prononcée du coté gauche que du coté droit. Je pense que l'on peut expliquer ce phénomène par la lésion du nerf sous-orbitaire. Quant à la sensibilité de la mastication, qui, un mois aprés l'accident, subsistait encore, on doit l'attribuer au passage dela balle au-devant de l'arcade alvéolaire, des os sous-maxillares et à l'ébranlement qui en a été le résultat."

692. For my own part, I do not pretend to have understood the case, which I have given, § 681, and which I observed and detailed merely as one of clinical observation and diagnosis. M. Beauchêne, the author of the second case, is absolutely in error in considering it as an affection of the sub-orbitar nerve.

693. I had *this* sketch taken of my patient; it is *still* an interesting portrait.

694. The case to which *this other* portrait be-

longs is of more recent date. It is not better portrayed, but it is better understood:—

695. George Jefferson, aged forty, formerly a lamp-lighter, now a seller of fruit in the streets, was affected three years ago with general rheumatism, in the midst of which this singular affection of the muscles of the face came on.

696. The two sides of the face are not alike; the left is nearly natural, but the right is affected with spasmodic contraction: the chin is drawn to one side and dimpled; the right angle of the mouth is drawn downwards; the right eye-brow is higher than the left. Sometimes there is a little rapid spasmodic action of the muscles.

697. When he is told to shut the eyes promptly and forcibly, the distortion is tenfold: the right eye is drawn and only partially closed; the right angle of the mouth is drawn spasmodically downwards; the nose and the chin are drawn to the right side.

698. He laughs, and bites, perfectly, on the left side. On attempting to open the mouth wide, it is obviously *tied* by the muscles of the right side. He cannot whistle; in the attempt to do so, the mouth is drawn to the right side.

699. He takes snuff through both nostrils indifferently; on sneezing, the left side of the face is chiefly distorted.

700. The right side is a little benumbed in feeling. It is also colder, after exposure to cold, than the left.

701. Besides these two cases, I have seen

several others; in one there was a defect of vision, with the spasmodic tic; in another, the tic was confined to the outer portion of the orbicularis. The former was of the most extreme character, the face being exceedingly distorted on each spasmodic attack. The latter was comparatively slight. The former probably arises from disease of the facial nerve within the cranium; the latter appears confined to that branch of the facial, exterior to the cranium, which supplies the orbicularis.

702. The remedies for this disease are unknown. In the severer case just mentioned, aperients and mercury have been fully tried, in vain. I have proposed local depletion and counter-irritation, by means of the cupping instruments.

III.—SPASMODIC TORTICOLLIS.

703. This spasmodic affection of the sterno-cleido-mastoid muscle has long been known to physicians. It is obviously of the same character as the spasmodic strabismus, and spasmodic tic—an affection of the *true spinal motor* nerves.

704. The following interesting case was communicated to Sir Charles Bell by Dr. Knight:*

705. "Sir,—About December, 1827, Master —— was seized during the night with a stiff neck; it excited little attention; he played with his schoolfellows as usual; some of whom playfully, but rather rudely, twisted his head in a contrary

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*The Nervous System, p. cliii.

direction. When he returned home at the Christmas holidays, I was requested to see him. I found his general health very much deranged, and his sterno-cleido-mastoideus muscle on the right side rigidly contracted. Leeches and fomentations were applied to the mastoid extremity of the muscle; alterative medicines were prescribed; strict attention was paid to the bowels; and after some weeks his general health very much improved: still the muscle remained as rigid as ever. During the summer, his father took him to London, and you were consulted. I believe he was advised to go to the sea, and a steel apparatus was recommended. The sea, I understood, was of service to him; but as the apparatus did not improve his neck, and injured his back, it was, after some weeks' trial, laid aside. A vigorious system of shampooing was then adopted, together with very active exercises. His health improved; he grew taller, and stouter; and by a great effort he could stand straight: but the moment he relaxed his efforts, his chin turned towards his shoulder, his spine became curved, and he relieved himself by resting on one leg.

706. "All remedial measures were at length abandoned, and this last half year he was sent to school. His general health has continued good, but his sterno-cleido-mastoideus is just as it was.

707. "Mr. —— has requested me to correspond with you respecting his son, I presume, to learn whether, from my description, and your notes or recollection, you have any further plan

to propose. Whether you would recommend any division of the muscle, or whether, before giving any further opinion respecting him, you would wish to see him. In the latter case, I believe his father would immediately take him to London.

I am, Sir,
Respectfully yours,
ARNOLD KNIGHT, M.D."

708. "This young gentleman is gradually improving by shampooing and proper exercises, which put the muscle on the stretch."

709. Sometimes the head is drawn to the shoulder; sometimes it is moved to and from one side, with a rocking motion.

IV.—SPASM OF THE RESPIRATORY MUSCLES.

710. The following sketch is taken from Sir Charles Bell:—*

711. "The condition of this woman is very peculiar: in her, common breathing inspiration is performed with a sudden spasmodic action: but she is also affected at intervals with more violent spasms, and her respiration is then hurried and distressing. On the commencement of a paroxysm, she bends her body slightly forwards, and thus prepares herself, as it were, for the attack: her nostrils are dilated widely, the angles of her mouth are dragged forcibly downwards, there is a constriction of the throat, and the shoulders and the chest rise convulsively, as when a person has

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* The Nervous System, p. cxi.

cold water poured upon the head; the inspirations are deep and violent, and are attended with a sniffing of the nostrils, the air being inhaled through them only, and not through the mouth. The fibres of the platysma myoides start into view, and there is quick rising and falling of the pomum Adami; the sterno-cleido-mastoideus and trapezius on both sides, act powerfully, fixing the head and elevating the shoulders.

712. "The spasmodic action of these muscles exists to a considerable degree constantly, yet it increases in paroxysms which last so severely for a few minutes that she is deprived of the power of speech, and seems to be almost suffocated. These paroxysms recur at irregular intervals. It was observed by the attendants, that when she was excited by walking about the ward or by replying to our questions, they returned more frequently.

713. "She could move her head with perfect freedom when we requested her, but still the spasmodic action continued. She also raised either shoulder, or twisted her face to one side, when she was desired. This woman continued under the care of the physician for about a month, and was discharged cured."

714. I have recently attended a patient, a young gentleman, aged about twenty, who experiences attacks of a peculiar affection of the movements of *respiration:* he lost the power of articulation; on attempting to speak, he was suddenly seized

with a spasmodic action of the diaphragm, which induced a sudden *inspiration*, with a hissing noise as the air entered through the lips, and pain in the points of attachment of the diaphragm. This affection yielded to attention to diet and to the state of the bowels.

715. These and other affections of the true spinal *motor* nerves agree in several particulars:—1, they are usually suspended during sleep; (in this they differ from *similar* affections *excited* through the true spinal *excitor* nerves, which frequently come on during sleep:) 2, they are redoubled by any cause of mental hurry or excitement.

716. Notwithstanding what has been said, I consider it still a question important to determine, whether any, and which, of these diseases may have their origin in the excitor nerves, or in the true spinal axis?

ON DISEASES OF THE GANGLIONIC NERVES.

717. Little is known of the diseases of the Ganglionic Nerves.

718. I have already brought before you the facts relative to the effects of the division of the *fifth* within the cranium, as discovered by M. Magendie, § 504. These facts are sufficient to prove that the *fifth*, as a ganglionic nerve, is the organ of nutrition of the eye, the gums, &c.

719. The effects of the division of the pneumogastric on the lungs and the stomach, as demon-

strated by the experiments of Dr. W. Philip and Sir Benjamin Brodie, prove this to be a secretory nerve. There are no *cases* on record, I believe, with the exception of a very defective one by M. Gendrin,* in which the pneumo-gastric was distinctly affected, and especially in which the influence of its disorganization upon the lungs, stomach, and other internal organs were traced.

720. There is *still* an interesting inquiry open to us, relative to the defective development and nutrition of the *internal organs* and *external limbs*, &c. from diseases of the internal and external ganglionic systems.

721. Some diseases are obviously affections of the internal ganglionic nerves: we have *augmented action*, for instance, of the liver and kidney, in the cholera Europæa, and enuresis; we have *paralysis* of the same organs in the cholera Indica,—in some cases of icterus, and in ischuria.†

722. I here close, then, my observations upon the Nervous System and its Diseases, for the present. If they have interested and, instructed you if they have led you to reflect upon these interesting maladies, my object will have been accomplished.

723. I shall be still more gratified if you are in-

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* Translation of Abercrombie, ed. 2, p. 109.

† For the influence of the Spinal Marrow on the secretion of the urine, see Prout's Inquiry into Affections of the Urinary Organs, ed. 2, 180; Ollivier, Traité de la Moëlle Epinière, ed. 2, 418; p. Mr. Stanley in the Medico-Chirurgical Transactions, vol. xviii. p. 271.

duced to bear the subject in your minds, and assist me by your observations.

724. The subject is but *sketched*. Perhaps it can scarcely be said even to be sketched. It is full of promise in reference to Anatomy, Physiology, and Practice.

725. I must here supply an omission made p. 129; after § 535, I ought to have added—

II.—AUGMENTED ACTION.

I. *Of the Sentient Nerves.*

726. Opposed to *paralysis*, is *augmented action*. This induces, in reference to the sentient nerves, various kinds of *pain*, the principal of which are those which occur in—

I. *Inflammation; Ulceration; Tumors; &c. of the Nerves.*
II. *Neuralgia, or Tic Douloureux.*
III. *Hemicrania Intermittens; Brow Ague, &c.*

727. In reference to *inflammation of the nerves*, M. Descot observes,—"L'inflammation idiopathique aguë d'un nerf doit, je crois, se rencontrer très-rarement.

728. "Les nerfs sont quelquefois affectés d'une inflammation chronique, et on l'observe généralement à leur extrémité dans le moignon des membres amputés." "Lorsque les nerfs sont dans cet état, le moindre contact cause aux malades des douleurs assez fortes pour les obliger à se soumettre à une seconde amputation.

729. "Dans beaucoup de cas de sciatique, je crois que le nerf sciatique est le siége de la ma-

ladie; la douleur suit, en général, si exactement le trajet du nerf, et les parties voisines sont tellement libres de toute apparence pathologique, que je crois que le nerf seul est le siége de la douleur; et l'affection, ce me semble, doit naître d'une action inflammatoire dans le névrilème, laquelle se termine souvent par l'épanchement d'un fluide séreux." p. 195.

730. The *subcutaneous tubercle* is attended with most acute pain, proceeding from one point, often extending along the course of the nerves, occurring in paroxysms, which take place spontaneously, or are occasioned by friction or other slight injury of the part, and which frequently disturb the night's repose. The case is distinguished by an examination of the part affected, when a small body, of the magnitude of about half a small pea, is felt under the integuments: this part is generally tender to the touch, especially during the paroxysm; and an acute pain is induced, and is extended along the nerve, by pressure.

731. I published a case of this affection in the Edinburgh Med. and Surg. Journal, vol. xi. p. 466. It occurred in the thumb of a shoemaker, probably from a puncture of his awl. It was cured at once, after years of suffering, by excision.

732. The pain of *tic douloureaux* occurs in paroxysms, which are sudden, irregular in their occurrence, frequently more or less transient or momentary, induced by the act of eating, or talking, or by the contract of external bodies with the acutely sentient extremities of the nerves.

733. This disease is distinguished by that which

the term *tic* means originally; viz. by a sudden contraction of several muscles, with distortion of the face. Its seat is various—in different parts of the face, of the limbs, and of other parts of the surface of the body.

734. Many remedies have been proposed for this formidable malady, as division of the nerve, arsenic, carbonate of iron, &c. It frequently arises from derangement of the primæ viæ, which must be carefully corrected.

735. The *hemicrania intermittens*, or *brow ague*, is apt to recur in spring or autumn, from exposure to the north-east wind: it prevails in damp and marshy districts, and it is frequently observed to accompany the epidemic influenza. It frequently exists as a complication of intermittent.

736. This ague pain occupiesthe brow, the temple, the forehead, the occiput, &c.: it occurs in paroxysm frequently of a considerable regularity; it is often excruciating, occasionally inducing delirium, and, still more frequently, redness of the conjunctiva. It may occur once or twice in the course of the day.

737. This pain is almost certainly removed by the quinine or the arsenic.

738. For a full account of these painful diseases, I may refer you, with great satisfaction, to the works of Sig. Bellingeri and Sir Charles Bell; and to the still more recent works of Mr. Swan,* in this country, and of M. Descot,† in France.

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* Treatise on Diseases and Injuries of the Nerves, new ed. 1834.

† Dissertation sur les Affections Locales des Nerfs; Paris, 1825.